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ABSTRACT

This report is a study of the degree of equalization of school district revenues and tax rates in Minnesota, with emphasis on changes that have occurred over recent years. The report was prepared by the research staff of the Minnesota Senate and House of Representatives. The study places emphasis on the role of school district property wealth in the education finance system. The methodology and terminology of the study are explained. A recent history of Minnesota education finance is provided. The analysis of the study includes (1) disparities in revenue per pupil; (2) disparities in tax rates; (3) the relationship of revenue to tax rates; (4) the relationship of revenue to property wealth; and (5) the relationship of tax rates to property wealth. A synthesis of the results is provided in the conclusion. Appended are the supporting data regarding the relationship of tax rates to wealth, as well as a formula for computing the bivariate gini coefficient. There are 11 references. (SI)

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Equalization Trends in Minnesota Education Finance, 1972 through 1987

Legislative Commission on Public Education

Staff Report
September, 1986

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EQUALIZATION TRENDS IN MINNESOTA EDUCATION FINANCE, 1972 THROUGH 1987

A Staff Report to the
Minnesota Legislative Commission on Public Education

by

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September, 1986

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I. INTRODUCTION

This report is a study of the degree of equalization of school district revenues and tax rates in Minnesota, with emphasis on changes that have occurred over recent years. The report was prepared by the research staffs of the Minnesota Senate and House of Representatives for consideration by the Legislative Commission on Public Education. The impetus for conducting the study came initially from a provision in the 1985 Omnibus Education Finance Bill, encouraging the Legislative Commission on Public Education to study school district foundation and retirement revenue. The provision in the bill suggested twelve specific topics for study, one of which was "...trends in the degree of equalization of school district revenues and tax rates...."[1]

The purpose of the study, then, is to study trends in equalization of school district revenues and tax rates. However, a study of differences in revenue and tax rates alone does not provide sufficient information to assess the overall equity of the school finance system. Therefore the study was broadened to include other questions, with particular emphasis on the role of school district property wealth in the education finance system.

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[1] Laws of Minnesota for 1985, First Special Session, Chapter 12, Article 1, Section 34.

The first step required was to form an understanding of the meaning of "equity." Equity in education finance is a goal that most would endorse, at least in principle. Equity among public schools is required in some form by the Minnesota Constitution, which states:

> The stability of a republican form of government depending mainly upon the intelligence of the people, it is the duty of the legislature to establish a general and uniform system of public schools.[2]

However, there is not unanimous agreement as to what actually constitutes "equity," "equalization," or a "uniform system of public schools." Further, even if agreement could be reached on a definition of equity, there are other goals, such as efficiency (which is also required by the Minnesota Constitution) and local control, which may be more important to some people.

The ideal concept of equity might be to provide equal educational opportunity for each child according to the child's individual needs. However, this is a difficult concept to measure, because so many subjective judgments are required. Most research on the subject of equalization proposes to measure

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[2] Constitution of the State of Minnesota, Article XIII, Section 1.

equalization in terms of equal inputs to each child's education, with "inputs" variously defined. At its simplest, equal inputs means equal dollars for the education of pupils whose abilities and needs are comparable (e.g., who are not handicapped). Some more elaborate models attempt to provide equal inputs by adjusting for unique needs of pupils or districts, and for cost and price differences.

This study makes no attempt to examine cost differences among school districts. Further, it does not attempt to determine whether differences in revenue per pupil are warranted by differences among school districts in market costs, staff composition, economies of scale, needs of pupils, choice of program offerings, or any other of the myriad of factors that can affect school district costs. An examination of cost differences is an important course of inquiry for Minnesota education finance researchers, but is beyond the scope of this study.

The report consists of nine chapters. The next chapter, Chapter II, explains some of the methods used to collect and analyze data in this study. It also contains a brief glossary. Chapter III gives a brief history of education finance in Minnesota over the last fifteen years, highlighting major changes and important developments. This background helps to explain the causes of some of the trends described later in the report.

Chapter IV begins the data analysis of the study, with an exploration of the distribution of revenue per pupil among Minnesota school districts.

Chapter V follows with analysis of data on the distribution of tax rates in school districts. Tax rates are closely tied to revenues, as school boards and local voters make choices as to how much revenue to raise locally. In this respect, tax rates directly affect the equalization of revenues. Moreover, tax rates represent another major dimension of education finance equity: equity for taxpayers in different districts.

In Chapter VI, the relationship of revenue per pupil to school district tax rates is examined. If the system is equitable, there should be a positive relationship between tax rates and revenues. Districts with high tax rates should receive more revenue than districts with much lower tax rates.

School district property wealth is an important focal point of research and discussions on education finance in academic, political, and legal settings, because district property wealth is usually regarded as the primary measure of ability to pay. It has long been contended that the quality of a pupil's education should not depend on the wealth of the community in which the pupil's parents choose to live.[3] Courts in a number of states have upheld this principle. In this study, the relationship of school district property wealth to school district revenues and

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[3] John E. Coons, William H. Clune III, and Stephen D. Sugarman, Private Wealth and Public Education (Cambridge, Mass.: The Belknap Press of Harvard University Press, 1970). p. 2.

tax rates is given special attention as the subject of two chapters. Chapter VII analyzes the relationship of revenue per pupil to property wealth per pupil, and Chapter VIII explores the relationship of school district tax rates to property wealth.

Chapter IX, "Synthesis and Conclusions," draws together some of the data from the earlier chapters and sets forth conclusions that can be drawn from the results.

II. METHODOLOGY AND TERMINOLOGY

This study builds on a study done by Joyce Krupey and Alan Hopeman and published in the Journal of Education Finance in 1983.[1] The earlier study analyzed school district revenue and tax rate equity in Minnesota for three school years: 1972-73, 1978-79, and 1981-82. The present study repeats most of the analysis of the 1981-82 school year, and adds four subsequent years: 1983-84, 1984-85, 1985-86, and 1986-87. This study also includes some analytic techniques and categories of data that were not included in the 1983 study.

Some parts of the analysis done in the 1983 study were deemed not necessary or not relevant and were not repeated. In general, the results of the current study matched the results for the 1983 study for the one year of overlap (1981-82). Where differences in results occur, they are due to the fact that the 1981-82 pupil counts and other enrollment measures used in the 1983 study were estimates. Such estimates were replaced with final 1981-82 data in this study.

The study is based upon data obtained from the Minnesota Department of Education. Data analysis was performed by the authors using two software packages: School Finance Equalization

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[1] Joyce E. Krupey and Alan Hopeman, "Minnesota School Finance Equity, 1973-82," Journal of Education Finance 8 (Spring, 1983), pp. 490-501.

Management System (SFEMS) and Statistical Package for the Social Sciences (SPSS).

Wherever possible, the study used final, complete data. In some cases, however, estimates of data items were used. This is true of data that depends on pupil counts or enrollment measures for the 1985-86 or 1986-87 school years, for which final data were not available.

Assumptions

This study seeks to analyze the degree of equalization in revenue available to Minnesota school districts, rather than in actual expenditures. Revenue available to districts was used because the study focuses on the education finance resources that the state provides for school districts, rather than on the choices school districts make as to when or how to spend those resources. Actual expenditures were not used because districts may choose to save revenue for future years, or to spend revenue from future years in a current year. Thus actual expenditures may not adequately describe the degree of equity or inequity that exists in the state school finance system.

Some judgments have to be made as to what constitutes revenue available to a school district. In general, revenue was considered available if districts could, by a vote of the school board, obtain the revenue from property taxes or state aid. Revenue was not considered available if voter approval would be required and had not already been obtained. Revenue from referendum levies was deemed to be available only if the voters had

granted approval and the district actually certified such a levy. In the case of the discretionary aid and levy in 1981-82 and 1983-84, this revenue was also deemed to be not available if the district did not certify the levy. In the case of all other foundation program revenue for all years studied, revenue was considered to be available regardless of whether the district chose to collect its maximum permitted levy and maximum aid amount.

The analysis of revenue was confined to foundation program and referendum revenue. Categorical revenue--whether from state or federal sources--was not considered. Nor was revenue from other sources considered, such as fees, income from investments, or gifts.

Whenever possible, statistics for school districts were "weighted" according to the number of actual pupil units (WADM) in the district. This ensures that statistics are not distorted by data for small districts. Percentiles and deciles were all calculated using district data weighted in this manner. The one exception was correlation analysis, which was conducted using unweighted district data.

Tax rates were computed in several forms. Gross total school tax rate, gross foundation tax rate, and gross foundation plus referendum tax rate were computed for all years. In addition, total school tax rate net of state-paid credits, foundation tax rate net of credits, and foundation plus referendum tax rate net of credits were calculated for the 1983-84, 1985-86, and 1986-87 school years. Finally, for the 1985-86 school year only,

the levies for cities, counties, towns and other jurisdictions were apportioned to the appropriate school districts and added to the school district levy, to calculate the gross tax rate for all jurisdictions, by school district.

The study makes extensive use of analysis of data by deciles. In this form of analysis, districts are sorted in ascending order based upon their values for the independent variable, e.g., EARC per WADM. Districts are then divided into ten groups, each group having an approximately equal number of pupil units, and preserving the heirarchical order based upon the independent variable. These groups are known as deciles. The weighted mean, or weighted average, value of the dependent variable is then calculated for each decile.

Terminology

Some of the terms used in this study bear definition, for the sake of clarity and consistency. A brief glossary follows this paragraph. One point regarding terminology requires emphasis in that it differs from the terms used in the 1983 study: the terms "foundation revenue" and "foundation levy" do not include referendum revenue or referendum levies, unless specifically so stated, in this study. In the 1983 study, the referendum levy was included and termed part of foundation levies and foundation revenue.

Glossary

EARC: Adjusted assessed valuation, as determined by the Equalization Aid Review Committee.

Foundation Levy: The sum of the following levies, as applicable to the school year considered:

- basic maintenance levy
- replacement levy
- discretionary levy
- low fund balance levy
- grandfather levy
- cost differential tier levy
- tiers 2 through 5 levies
- declining pupil unit levy

Foundation Revenue: The sum of revenue from the foundation levy described above, plus state foundation aid associated with each component of the foundation levy.

Gross tax rate or gross levy: A tax rate or levy computed without subtracting state-paid property tax credits: homestead, agricultural, agricultural preserve, native prairie, etc.

Net tax rate or net levy: A tax rate or levy computed after subtraction of state-paid property tax credits.

Referendum Revenue: General operating revenue derived from a levy approved by voter referendum. This includes referendum aid paid to equalize such levies in taconite districts.

Tax rate: Rate of taxation, expressed in EARC mills.

Tax rate for all jurisdictions: Total property tax rate, by school district, for all taxing jurisdictions, including city, county, township, special taxing units, and school district.

WADM: Weighted average daily membership (sometimes called "actual pupil units"). The weights are 0.5 pupil units per kindergarten pupil, 1.0 pupil units per pupil in grades 1-6, and 1.4 pupil units in grades 7-12. Handicapped kindergarten and pre-kindergarten pupils are individually weighted according to the number of hours of educational service the pupil receives.

III. RECENT HISTORY OF MINNESOTA EDUCATION FINANCE

The revenues and taxes of Minnesota school districts are governed by a complex set of education finance laws. Changes in these laws have affected the equalization trends discussed later in this report. This chapter describes changes over the last 15 years in the laws affecting foundation and referendum revenue. The first four sections of the chapter are chronological; they describe general changes in the laws from 1971 through 1986. The next two sections are, in a sense, subplots. They describe trends in two more limited topics: treatment of "off-formula" districts and use of the referendum levy.

1971 Reforms--The Minnesota Miracle

Prior to 1971, local property taxes were the primary source of revenue for Minnesota public schools. The state had a foundation aid formula which provided a guaranteed level of revenue per pupil unit, or "formula allowance," to all districts. To receive the revenue, all districts had to levy property taxes equal to a uniform statewide mill rate times the district's property valuation (as measured by the EARC value, or adjusted assessed value). State foundation aid equaled the difference between the guaranteed revenue and the amount raised by the required local levy. However, the guaranteed revenue was far less than most districts actually spent. In 1970-71, the formula allowance was only 55 percent of the median expenditure per pupil unit for general

operating expenses.[1]

Most districts relied on property tax levies to finance the gap between foundation revenue and actual expenditures. Since property wealth varied greatly among districts, the reliance on property taxes resulted in wide disparities in tax rates and per-pupil revenue. These disparities, coupled with rapid property tax increases during the late '60s, created pressure for reform in 1970 and 1971.[2]

In 1971, the Legislature and Governor responded to this pressure by enacting a comprehensive set of reforms in education finance and property tax laws. These reforms, later dubbed the "Minnesota Miracle," made the following changes in education finance.

1. The foundation aid formula allowance was raised, bringing it closer to the level of actual expenditures per pupil unit.
2. All districts were classified as either "low spending" or "high spending," based on whether their actual 1970-71 operating expenditures per pupil unit were below or above the state average.

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[1] Van D. Mueller, Michael J. Lovett, and Gary P. Farland, Paying for the Public Schools: The ABC's of Minnesota School Finance (St. Paul: Minnesota Department of Education, 1978), p. 3.

[2] Alan R. Hopeman and Marsha Gronseth, "Minnesota School Finance: A Guide for Legislators" (St. Paul: Research Department, Minnesota House of Representatives, 1983), p. 1.

3. Low spending districts did not receive the full formula allowance. Instead, the law specified that their formula allowance each year would be equal to the full formula allowance minus the difference between their actual 1970-71 expenditures per pupil unit and the state average.

4. High spending districts received the full formula allowance. In addition, they were permitted a "grandfather levy" equal to the amount by which their 1970-71 expenditures exceeded the state average.

5. Additional pupil units were granted for students whose families received Aid to Families with Dependent Children (AFDC). Each AFDC student counted as an extra .5 pupil unit.

6. Districts with declining enrollments also received additional pupil units. If a district's actual pupil units declined from one year to the next, aid was paid based on the average of the two years' figures.

7. Uniform statewide levy limits were imposed for the first time. The limits could be exceeded only if approved by voters in a referendum.

These reforms went into effect in the 1972-73 school year--the first year included in this analysis. Their chief initial effect was to shift the primary source of education funding from local property taxes to state taxes. As a result, disparities in tax rates were reduced. But the 1971 reforms did not reduce

disparities in per-pupil revenue. They essentially fixed in place the disparities that existed in 1970-71.

1973-1978 Changes

Several important changes were enacted between 1972-73 and 1978-79, the second year included in this analysis.

1. The 1973 Legislature enacted a "catch up" provision for low spending districts, designed to gradually bring their formula allowances up to the full amount.
2. To supplement the "basic" AFDC pupil units approved in 1971, the 1973 Legislature added "concentration" units for districts in which the number of AFDC pupils was at least five percent of the total pupil units. The formula for concentration units was changed several times during the '70s.
3. The 1973 Legislature also approved extra pupil units for districts in which enrollment growth exceeded four percent in a year. Both this formula and the pupil unit formula for declining enrollment districts were changed several times between 1973 and 1978.

By 1978-79, the "catch up" provision was fully implemented, giving all districts the same formula allowance. This change reduced disparities in per-pupil revenue. The additional pupil units for AFDC students and for declining and growing enrollments had the opposite effect. By attempting to compensate for factors which increased costs in selected districts, they provided much more revenue to some districts than to others.

1979-1982 Changes

The 1979 Legislature enacted several significant changes in education finance formulas, described below.

1. A new "sparsity aid" formula was adopted, to compensate for diseconomies of small size in districts which were both small (as measured by secondary school enrollment) and geographically isolated. This aid went into effect in the 1979-80 school year.
2. In the 1980-81 school year, the existing funding formulas for sparsity and for enrollment growth and decline were replaced with a new "replacement aid and levy." Each district's 1980-81 replacement revenue was exactly the same as it would have been if the old formulas had been retained. But while the revenue from the old formulas had been virtually all state aid, the new formula was funded through a combination of aid and local levies, equalized in the same proportions as basic foundation aid. Furthermore, beginning in 1981-82, replacement revenue was not recalculated each year based on current data. Instead, each district's replacement revenue per pupil unit was the same as in 1980-81, except for an inflation adjustment.
3. The grandfather levy was equalized beginning in 1980-81, by adding a new "grandfather aid." If a district had below average property valuation per pupil unit and it qualified for a grandfather levy, part of the levy was replaced by state aid. In addition,

grandfather revenue was changed from an amount per pupil unit to a fixed dollar total.

4. Also in 1980-81, all districts were permitted to make an additional "discretionary levy" of up to one-half mill. The state guaranteed a specified amount of revenue per pupil unit ($27.50 in 1980-81). State aid made up the difference between the guaranteed revenue and the levy.

By the 1981-82 school year--the third year analyzed in this report--all of the changes described above were at least in their second year. This basic framework remained in place through 1983-84, with only two significant changes. First, the discretionary aid and levy was gradually increased; between 1980-81 and 1983-84 the guaranteed revenue per pupil unit increased from $27.50 to $153.65, and the mill rate increased from .5 mill to 2.5 mills. Second, the 1982 Legislature enacted a "low fund balance aid and levy," effective with the 1983-84 school year. It provided additional revenue, through an equalized aid and levy, to districts with operating fund balances below $316 per pupil unit.

1983 to 1986--The Five Tier System

By 1983-84, the state's foundation revenue system was quite different than it had been in 1972-73. In addition to basic foundation aid and levy, the system included four additional aid and levy components: grandfather, replacement, discretionary, and low fund balance.

Dissatisfaction with these four components seemed to grow in the early '80s. There were three primary complaints. First, the system was very complex. Each of the components had its own unique formula and few people understood all of them. Second, the basis for some of the formulas was becoming increasingly outdated. The grandfather formula was based on a district's expenditures in 1970-71; the replacement formula was based primarily on enrollment changes during the late '70s. The third complaint, which may have been the most important, was that some districts received a great deal of revenue from these four components, while others received very little. Some of the low-revenue districts called this unfair, claiming that their costs and revenue needs were as great as the high-revenue districts.

The 1983 Legislature attempted to satisfy these complaints by replacing the four additional components of foundation revenue (grandfather, replacement, discretionary, and low fund balance) with a new five tier system of discretionary levies and aid. The new system went into effect in 1984-85.

The first tier, also called the cost differential tier, provided varying amounts of revenue to districts, based on two separate allowances. The training and experience allowance was based on the level of education and years of experience of each district's teachers. The sparsity allowance was very similar to the sparsity portion of the replacement component.

The second tier provided districts with revenue of $150 per pupil unit. However, the revenue was reduced or eliminated for

districts with fund balances greater than $500 per pupil unit. The third and fourth tier each provided revenue of $100 per pupil unit to all districts.

These four tiers provided most districts with more revenue than they would have received from the previous four components. In some cases, the additional revenue was several hundred dollars per pupil unit. To limit the state cost and property tax impact of the system, this additional revenue was "phased in" over four years, by initially reducing the tier allowances below the full amounts specified in the law. Thus, many districts will not actually receive their full revenue from the first four tiers until the phase-in is completed in 1987-88.

There were some districts for which the first four tiers provided less revenue than the previous four components. For these districts, the fifth tier served essentially as a new grandfather provision. It ensured that all districts would receive at least as much revenue from the tiers as they would have received from the previous components, plus a "minimum increase" of $25 per pupil unit.

All five of the tiers included both state aid and a local property tax levy. The first two tiers were equalized with the same proportions of aid and levy as in the basic foundation formula. The third tier was equalized with a somewhat lower proportion of aid, and the fourth and fifth tiers at an even lower level.

The five tier system remains in effect in 1986-87. However, several changes have been made since 1983. In 1984, the

Legislature doubled the sparsity allowance for all qualifying districts and increased the training and experience allowance by 62.5 percent. These changes took effect in 1985-86. In 1985, the Legislature enacted two changes which went into effect in 1986-87. First, $25 was added to the "minimum increase" provision; this increases fifth tier revenue for some districts. Second, a new declining pupil unit aid and levy was created; it provides additional revenue to all districts in which total pupil units (including AFDC units) decline from the previous year.

Treatment of Off-Formula Districts

A foundation aid formula guarantees all school districts a certain level of revenue (the formula allowance times the district's pupil units) in return for a required local effort (the basic mill rate times the district's adjusted assessed value). State aid makes up the difference between the guaranteed revenue and the required local effort. However, in districts with high levels of property valuation per pupil unit, the required local effort may exceed the guaranteed revenue. Such districts are said to be "off the formula."

How these off-formula districts are treated can affect equalization of revenue and tax rates. If the tax levy is limited to the amount of the guaranteed revenue, off-formula districts will have lower tax rates than other districts. If off-formula districts are allowed to levy the full basic mill rate, their tax rates will be closer to those of other districts but their revenue per pupil unit will be higher.

The Legislature has struggled with this issue frequently over the last 15 years. This section briefly describes changes in the way that off-formula districts have been treated.

Prior to 1976, no special provisions were made in law for districts off the formula. All districts were permitted to levy the full basic maintenance levy (i.e., the required mill rate times the district's EARC valuation). If the levy exceeded the formula allowance times the district's pupil units, the district was allowed to keep the "excess" revenue.

The 1976 Legislature enacted an "aid recapture" provision, which took effect in the 1977-78 school year. If a district was off the formula, its entitlements for transportation aid, secondary vocational aid, and special education aid were reduced. The amount of the reduction was limited to 20 percent of the excess revenue (i.e., the amount by which the district's basic maintenance levy exceeded the formula allowance times the number of pupil units) in the 1977-78 school year, 60 percent of the excess revenue in the 1978-79 school year, and the full amount of the excess revenue in the 1979-80 school year and beyond.

This provision reduced the revenue advantage that most off-formula districts had over other districts. Instead of being allowed to keep their "excess" basic maintenance revenue, off-formula districts were forced to use the excess to replace state categorical aids that had been "recaptured." However, in some districts there was still some excess revenue left after all of the categorical aids had been recaptured. The 1978 Legislature

reduced this remaining advantage by limiting basic maintenance levies in off-formula districts to the greater of:

(1) the formula allowance times the number of pupil units, plus the district's entitlements for the categorical aids that would be recaptured; or

(2) the district's basic maintenance levy for the 1978-79 school year.

This limitation went into effect with the levies for the 1979-80 school year. The second part of the limitation (clause (2) above) became known as the "off-formula grandfather." Districts affected by this clause (generally the districts with the highest property valuation per pupil unit) continued to receive more basic foundation revenue per pupil unit than other districts.

These provisions, particularly the aid recapture provision, were very controversial. They had a dramatic effect on the revenues and taxes of some off-formula districts. Pressure from these districts led to further amendments in 1979 and 1980. The aid recapture provision was limited to districts with 950 or more pupil units in the 1980-81 school year, and was eliminated entirely beginning with the 1981-82 school year. Basic maintenance levies were essentially limited to the formula allowance times the district's pupil units, although the off-formula grandfather provision was retained. With these changes in place, most off-formula districts had no revenue advantage over other districts. But they did have lower basic maintenance tax rates than other districts had.

In 1983, the Legislature adopted a new aid recapture provision for off-formula districts, effective with the 1984-85 school year. This provision, called "revenue equity," was similar to the previous aid recapture provision. However, it encompassed virtually all categorical state aids, including state payments for employer contributions to teacher retirement funds and Social Security. The provision was to be phased in over six years; in 1984-85, the aid recapture was limited to one-sixth of the potential "excess revenue" (i.e., the difference between the full basic maintenance levy and the formula allowance times the number of pupil units).

Aid recapture proved to be just as controversial in 1984 as it had been five years earlier. The 1984 Legislature exempted "agricultural districts" (those in which agricultural property accounted for at least 60 percent of the district's property valuation) from aid recapture, beginning in the 1985-86 school year. The 1985 Legislature eliminated the aid recapture provision entirely, beginning with the 1986-87 school year. Basic maintenance levies are still limited, however, to the greater of the formula allowance times pupil units or the district's basic maintenance levy for the 1978-79 school year. As a result, off-formula districts have lower basic maintenance tax rates than other districts.

Referendum Levies

When the Legislature imposed uniform school district levy limits in 1971, it gave districts an escape clause. In addition

to the levies specifically authorized in law, a district could levy any additional amount approved by voters in a referendum. The proceeds of the levy would be placed in the district's general fund, and could be used for virtually any general operating expenses.

Table 1 shows trends in use of the referendum levy, for each of the seven years analyzed in this report. For each year, the table shows the number of districts making a referendum levy, the state total of the levy, the state total amount per weighted ADM, and the amount of the referendum levy as a percentage of total foundation plus referendum revenue.

Table 1

Trends in Referendum Levy

School Year	Number of Districts	Total Referendum Levy	State Total Referendum Levy Per WADM	Percent of Foundation Referendum R
1972-73	1	$ 25,395	$ .02	0 %
1978-79*	74	7,067,813	7.50	0.6
1981-82	131	43,943,937	52.24	3.2
1983-84	185	68,854,632	84.48	4.3
1984-85	188	69,225,297	85.97	4.2
1985-86	198	79,719,756	99.61	4.5
1986-87	217	95,019,482	118.95	5.0

* For 1978-79, the table shows the maximum referendum levy limitation, rather than the actual amount levied. This overstates the 1978-79 total somewhat, since some districts probably did not levy the maximum. For 1981-82 through 1983-84, the actual certified referendum levy averaged just over 95 percent of the maximum levy limit.

Use of the referendum levy began slowly. In 1972-73, the first year it was available, only one district made a referendum levy; it was for only $25,395.

By 1978-79, 74 districts made referendum levies totalling just over $7 million. While this represented tremendous growth since 1972-73, the referendum levy was still a relatively minor financing tool for school districts. It averaged just $7.50 per WADM statewide, and accounted for only 0.6 percent of foundation plus referendum revenue.

After 1978-79, use of the referendum levy increased sharply. The state total grew from $7 million in 1978-79 to $44 million in 1981-82 and to $69 million in 1983-84.

The rapid growth slowed down temporarily in 1984-85, when the state total referendum levy was virtually the same as the year before. This slowdown may have been caused by the newly-enacted tier formulas, which resulted in substantial revenue increases for many school districts. Because of this additional revenue, school boards may have been less likely to seek voter approval for new referendum levies. Furthermore, some school boards chose not to levy the full amount which voters had previously approved.

Since 1984-85, use of the referendum levy has grown again. For 1986-87, half of the state's school districts (217 of 435 districts) have made referendum levies; the state total is over $95 million. This averages $119 per WADM statewide, and it accounts for five percent of foundation plus referendum revenue.

Summary

It is difficult to keep track of all the changes in education finance laws over the past 15 years. The laws and formulas are complex, and important changes are enacted almost every year. This chapter has described some of the changes and trends which have had the greatest impact on equalization of revenue and tax rates.

Some of the most important highlights are listed below.

1. The "catch-up" provision for "low spending" districts, which gradually brought their formula allowances up to the full amount, beginning in 1973-74.
2. The granting of additional pupil units for AFDC students and for enrollment growth and decline.
3. The numerous changes adopted in 1979, including replacement aid and levy, discretionary aid and levy, and the equalization of the grandfather levy.
4. The adoption of the five tier system in 1983, and the gradual phase-in of additional tier revenue.
5. The numerous changes in the treatment of off-formula districts.
6. The rapid growth in use of the referendum levy, particularly from 1978-79 to 1983-84.

Table 2 provides a summary of the provisions which have been in effect in each of the seven years analyzed in this report.

Table 2

Summary of Foundation Revenue Formulas and Trends
for Selected Years, 1972-73 through 1986-87

	1972-73	1978-79	1981-82	1983-84	1984-85	1985-86	1986-87
BASIC FOUNDATION AID AND LEVY							
Mill Rate	30 EARC Mills	28 Mills	21 Mills	24 Mills	24 Mills	23.6 Mills	23.2 Mills
Formula Allowance	Max. $663, less for "low spending" districts	$1095	$1333	$1475	$1475	$1585	$1690
Additional Pupil Units	AFDC - Basic Decline	AFDC - Basic & concentration Decline Growth	AFDC - Basic & concentration	AFDC - Basic & concentration	AFDC - Basic & concentration	AFDC - Basic & concentration	AFDC - Basic & concentration
OTHER COMPONENTS	Grandfather Levy	Grandfather Levy	Grandfather Aid & Levy Replacement Aid & Levy (for decline, growth, and sparsity) Discretionary Aid & Levy $64.48/p.u.	Grandfather Aid & Levy Replacement Aid & Levy Low Fund Bal. Aid & Levy Discretionary Aid & Levy $153.65/p.u.	Five Tier Aid & Levy System First year of phase-in	Five Tier Aid & Levy System Second year of phase-in More revenue for T&E and sparsity	Five Tier Aid & Levy System Third year of phase-in Higher "minimum increase" Declining Pupil Unit Aid & Levy
OFF-FORMULA DISTRICTS							
Lower mill rate for basic maint. levy	No	No	Yes	Yes	Yes	Yes	Yes
Aid recapture	No	Yes - 80% of excess revenue	No	No	Yes - 1/6 of excess revenue	Agricultural districts- No Other districts 1/3 of excess revenue	No
REFERENDUM LEVY							
Number of districts	1	74	131	166	168	198	217
State total	$25,395	$7,067,813	$43,943,937	$66,654,632	$69,225,297	$78,719,756	$95,019,482

IV. DISPARITIES IN REVENUE PER PUPIL

The simplest way to examine revenue equalization is to study the distribution of revenue per pupil among school districts, apart from any other variables. This approach has limitations. Some districts have higher costs than others, due to characteristics of students, labor force differences, small size, geographical isolation, and other factors. The state's foundation revenue formulas explicitly recognize some of these factors, thereby producing differences in revenue per pupil. Other revenue differences result from the referendum levy. Voters in some districts choose to pay higher taxes to support education, while voters in other districts are not willing to do so.

Thus, some differences in revenue per pupil are to be expected. Nevertheless, it is useful to study the size of the gap--or the degree of disparity in revenue per pupil--and to see how it changes over time.

Table 3 shows some summary statistics related to the distribution of foundation plus referendum revenue per WADM. The table covers the years included in the earlier study by Krupey and Hopeman (1972-73, 1978-79, and 1981-82) as well as the new years added in this study (1983-84 through 1986-87). In calculating these summary statistics, each district's values were weighted by the number of WADM.

For each year the table shows the 5th and 95th percentiles, the median, the mean, and the standard deviation. The last three

statistics in the table are three different measures of dispersion. They are explained below.

-- The first measure of dispersion is the ratio of the 95th percentile to the 5th percentile. A value of 1 would indicate perfect equality between the 5th and 95th percentiles; larger values indicate greater inequality. A value of 1.5 would indicate that, when districts are ranked by revenue per pupil, the top five percent all have at least 1.5 times the revenue of the lowest five percent.

-- The McLoone index measures the additional revenue that would be needed to bring all districts below the median up to the median level of revenue per pupil. It is expressed as the ratio of actual revenues of districts below the median to the revenue they would have if all were at the median. A value of 1 would indicate that the lower half of the districts all have the same revenue per pupil; smaller values indicate greater inequality.

-- The coefficient of variation is the ratio of the standard deviation to the mean. If all districts had equal revenue per pupil, the coefficient of variation would be zero. Larger values indicate greater inequality.

As reported in the earlier study, all three measures show a decrease in revenue disparities between 1972-73 and 1978-79,

followed by an increase in disparities between 1978-79 and 1981-82.

Table 3

Distribution of Foundation plus Referendum Revenue per WADM

Measure	1972-73	1978-79	1981-82	1983-84	1984-85	1985-86	1986-[illegible]
5th Percentile	$ 650	$1,121	$1,385	$1,604	$1,716	$1,897	$2,08[illegible]
Median	803	1,209	1,597	1,907	1,956	2,137	2,31[illegible]
95th Percentile	919	1,541	1,967	2,421	2,493	2,640	2,84[illegible]
Standard Deviation	94.71	131.27	192.80	265.26	254.74	256.82	277.9[illegible]
Mean	794	1,253	1,624	1,971	2,023	2,208	2,39[illegible]
Ratio of 95th to 5th Percentile	1.415	1.375	1.421	1.510	1.453	1.392	1.36[illegible]
Coefficient of Variation	.119	.105	.119	.135	.126	.116	.1[illegible]
McLoone Index	.8942	.9534	.9199	.9224	.9331	.9377	.94[illegible]

From 1981-82 to 1983-84, both the ratio of the 95th to the 5th percentile and the coefficient of variation increased further, showing a continued increase in disparities. The ratio increased from 1.421 in 1981-82 to 1.510 in 1983-84, while the coefficient of variation increased from .119 to .135. Both of these measures were higher in 1983-84 than they had been in 1972-73.

The McLoone index increased slightly between 1981-82 and 1983-84, from .9199 to .9224. This indicates some improvement in equality for lower-revenue districts, relative to the median value. This result would suggest that the increases in the other two measures between 1981-82 and 1983-84 were primarily due to relatively large revenue increases for high-revenue districts.

Since the McLoone index is not affected by the values in the upper half of the distribution, these revenue increases did not cause it to decline.

From 1983-84 to 1986-87, all three measures show decreasing disparities in revenue per pupil. The ratio of the 95th to the 5th percentile declined each year, going from 1.510 in 1983-84 to 1.360 in 1986-87. The coefficient of variation also declined, from .135 in 1983-84, to .126 in 1984-85, to .116 in both 1985-86 and 1986-87. The McLoone index continued to increase each year, going from .9224 in 1983-84 to .9429 in 1986-87.

Despite these improvements, two of the three measures indicate that revenue disparities in 1986-87 are greater than they were in 1978-79. The coefficient of variation is higher in 1986-87 (.116) than it was in 1978-79 (.105), while the McLoone index is lower (.9429 in 1986-87 compared with .9534 in 1978-79).

Impact of Referendum Levy

The earlier study by Krupey and Hopeman analyzed trends in foundation plus referendum revenue. For this study, a separate analysis was done of foundation revenue, excluding referendum revenue. There are four reasons why the referendum levy merits such special treatment. First, the amount of the levy has grown tremendously, as documented in Chapter III. It accounted for five percent of total foundation plus referendum revenue in 1986-87, compared with less than one percent in 1978-79. Second, referendum revenue varies among districts more than any of the components of foundation revenue. In 1986-87, for example, half

of the state's school districts have no referendum revenue, while the referendum revenue per WADM exceeds $500 in 44 districts and $1,000 in eight districts. Third, it is unequalized; unlike basic foundation aid, all five tiers, and declining pupil unit revenue, there is no matching state aid to go with the levy. Thus, it is difficult for districts with low property wealth to raise much revenue with the referendum levy. Fourth, it is different from the other components of foundation revenue in terms of the degree of control which the Legislature exercises. While the Legislature specifies exactly how much foundation revenue each district may receive, it has not imposed any limits on the amounts of referendum levies.

Table 4 shows summary statistics related to the distribution of foundation revenue per WADM, excluding referendum revenue. It includes the same seven measures that were included in Table 3. However, since this revenue variable was not included in the earlier study, no data are included for 1972-73 and 1978-79.

Table 4

Distribution of Foundation Revenue per WADM

Measure	1981-82	1983-84	1984-85	1985-86	1986-87
5th Percentile	$1,378	$1,597	$1,703	$1,868	$2,062
Median	1,566	1,846	1,889	2,061	2,224
95th Percentile	1,967	2,308	2,341	2,555	2,724
Standard Deviation	169.20	200.39	189.03	188.38	190.57
Mean	1,593	1,882	1,933	2,104	2,274
Ratio of 95th to 5th Percentile	1.428	1.445	1.374	1.368	1.321
Coefficient of Variation	.106	.106	.098	.090	.084
McLoone Index	.9318	.9343	.9468	.9536	.9589

The most obvious conclusion from comparing Tables 3 and 4 is that the disparities in revenue per WADM are smaller if referendum revenue is excluded. For 1986-87, the ratio of the 95th to 5th percentile is 1.360 for foundation plus referendum revenue, compared with 1.321 for foundation revenue alone. The coefficient of variation is .116 with referendum revenue, compared with .084 without it. And the McLoone index is .9429 with referendum revenue, compared with .9589 without it.

The data in Table 3 showed that disparities in foundation plus referendum revenue increased between 1981-82 and 1983-84. Table 4 shows that when referendum revenue is excluded, there is no clear trend in the degree of disparity between these years. The ratio of the 95th to the 5th percentile increased from 1.428 in 1981-82 to 1.445 in 1983-84. This suggests slightly greater disparities. But the coefficient of variation was the same in both years. And the McLoone index increased from .9318 to .9343, suggesting that disparities decreased for low-revenue districts.

For the period from 1983-84 to 1986-87, Table 4 shows a trend similar to that shown in Table 3. All three measures showed decreases in the degree of disparity in revenue per pupil. The ratio of the 95th to the 5th percentile declined from 1.445 in 1983-84 to 1.321 in 1986-87. The coefficient of variation declined from .106 to .084, and the McLoone index increased from .9343 to .9589.

Conclusions

The earlier study by Krupey and Hopeman showed decreasing disparities in revenue per pupil between 1972-73 and 1978-79, followed by increasing disparities between 1978-79 and 1981-82.

The new data presented here show that disparities in revenue per pupil continued to increase between 1981-82 and 1983-84. The referendum levy appears to be the chief reason for this increase. When it is excluded from the revenue totals, as shown in Table 4, there is no clear trend in the degree of disparities between 1981-82 and 1983-84.

Since 1983-84, disparities in revenue per pupil have clearly decreased. This result holds true for all three measures of dispersion used in the analysis; it also holds true regardless of whether referendum revenue is included in the totals. This shows that the new tier formula, which went into effect in 1984-85, has achieved at least some of the goals for which it was intended. It has reduced disparities in revenue per pupil.

But disparities have not decreased as much as some people may have expected or hoped. By two of the three measures, the disparities in foundation plus referendum revenue are still greater in 1986-87 than they were in 1978-79. There appear to be two factors which have limited the degree to which disparities have been reduced. The first is the ever-increasing referendum levy. If referendum revenue is excluded from the analysis, the degree of disparity is significantly smaller. The second factor is a series of revenue adjustments made by the Legislature in 1984 and 1985. These adjustments (an increase in the training

and experience allowance and the sparsity allowance, an increase in the "minimum increase" in the tier formulas, and the addition of declining pupil unit aid and levy) have generally benefitted high-revenue districts more than low-revenue districts. Thus, these adjustments have partially counteracted the equalizing effects of the original tier formula.

V. DISPARITIES IN TAX RATES

Most education finance systems are designed to keep disparities among districts in both revenue per pupil and property tax rates relatively small. Chapter IV examined disparities in revenue per pupil. This chapter analyzes disparities among districts in several different tax rates, apart from any other variables.

This analysis, like the analysis in Chapter IV, has limitations. Since districts have discretion regarding many aspects of their property tax levies (e.g., referendum, capital expenditure, and debt service levies), precisely equal effort is not expected. Differences in building and capital needs, and in voter willingness to pay additional taxes, inevitably lead to some variations in tax rates.

Despite these limitations, it can be useful to examine the degree of disparities in tax rates and to see how it changes over time. Increasing disparities may be a sign of increasing inequities. Chapters VI and VIII will take the analysis of the tax rates further, by analyzing how closely differences in tax rates are linked to differences in revenue and in property wealth.

Gross Tax Rates

Table 5 shows summary statistics related to the distribution of gross tax rates in four categories--the foundation tax rate, foundation plus referendum, the total school tax rate, and the rate for all taxing jurisdictions. For the foundation and total

school tax rates, data are included for five school years--1981-82 and 1983-84 through 1986-87. Data on the foundation plus referendum tax rate cover the same five years plus two earlier years, 1972-73 and 1978-79. Data on the tax rate for all jurisdictions were available only for the 1985-86 school year.

For each tax rate and each year, the table shows the 5th and 95th percentiles, the median, the mean, the standard deviation, and two summary measures of dispersion--the ratio of the 95th to the 5th percentile and the coefficient of variation. The meaning of these measures was explained in Chapter IV.

Foundation tax rate. Disparities in the foundation tax rate have declined steadily since 1981-82. The ratio of the 95th to the 5th percentile has declined from 1.371 in 1981-82 to 1.190 in 1986-87. Over the same period, the coefficient of variation has declined from .116 to .060.

The chief reason that foundation tax rates have become more equal is that access to "additional" foundation levies (i.e., levies in addition to the basic maintenance levy) has been expanded. In 1981-82, some districts had large grandfather and replacement levies, while many other districts qualified for only the basic maintenance levy and a one-half mill discretionary levy. Levies in these low-revenue districts have increased substantially, due to the increase in discretionary levies through 1983-84, implementation of the tier formulas in 1984-85, and continued phase-in of tier revenue through 1986-87. Currently, all districts can make substantial tier levies, in addition to the basic maintenance levy.

Table 5

Distribution of Gross Tax Rates

	1972-73	1978-79	1981-82	1983-84	1984-85	1985-86	1986-87
FOUNDATION TAX RATE							
5th Percentile			21.21	24.94	26.33	27.04	27.88
Median			23.81	28.81	29.36	29.69	30.37
95th Percentile			29.08	33.69	33.65	33.14	33.18
Standard Deviation			2.81	2.72	2.43	2.09	1.85
Mean			24.30	29.05	29.69	29.91	30.63
Ratio of 95th to 5th Percentile			1.371	1.351	1.278	1.226	1.190
Coefficient of Variation			0.116	0.094	0.082	0.070	0.060
FOUNDATION PLUS REFERENDUM TAX RATE							
5th Percentile	25.40	28.00	21.21	25.06	26.72	27.04	29.25
Median	31.50	29.76	24.16	29.58	30.37	30.62	32.01
95th Percentile	45.43	38.61	34.56	40.40	38.70	39.96	40.56
Standard Deviation	6.89	3.96	3.99	4.67	3.78	4.00	3.85
Mean	33.14	31.06	25.28	31.20	31.65	32.19	33.26
Ratio of 95th to 5th Percentile	1.789	1.379	1.629	1.612	1.448	1.478	1.387
Coefficient of Variation	0.208	0.127	0.158	0.150	0.119	0.124	0.116
TOTAL SCHOOL TAX RATE							
5th Percentile			28.96	33.42	35.33	36.33	38.93
Median			37.78	41.61	44.24	45.11	48.59
95th Percentile			47.34	52.69	52.74	54.62	57.37
Standard Deviation			5.72	5.93	6.18	6.19	6.33
Mean			37.35	42.09	43.92	45.66	48.14
Ratio of 95th to 5th Percentile			1.635	1.577	1.493	1.503	1.474
Coefficient of Variation			0.153	0.141	0.141	0.136	0.131
TAX RATE FOR ALL JURISDICTIONS							
5th Percentile						72.53	
Median						88.43	
95th Percentile						114.33	
Standard Deviation						12.72	
Mean						89.88	
Ratio of 95th to 5th Percentile						1.576	
Coefficient of Variation						0.142	

Foundation plus referendum tax rate. Data on the foundation plus referendum tax rate reveal that there were wide disparities among districts in 1972-73. As explained in Chapter III, districts classified as "high spending" levied the full basic maintenance levy of 30 mills, plus additional grandfather levies. "Low spending" districts had lower basic maintenance tax rates and no grandfather or other additional levies. The result was a gap of 20 mills, or nearly 79 percent, between the 95th and 5th percentile. Five percent of the state's students were in districts with levies below 25.40 mills; another five percent were in districts with levies above 45.43 mills.

By 1978-79, all districts levied the same basic maintenance mill rate. As a result, disparities in the foundation plus referendum tax rate were much smaller than they had been in 1972-73. The level of disparities increased, however, between 1978-79 and 1981-82. For example, the ratio of the 95th to the 5th percentile declined from 1.789 in 1972-73 to 1.379 in 1978-79, then increased to 1.629 in 1981-82. The coefficient of variation followed a similar trend.

The increase in tax rate disparities between 1978-79 and 1981-82 was partially caused by the creation of the replacement levy and the growth in the referendum levy. Tax rates for these levies varied greatly among districts. At the same time, the basic maintenance mill rate--which was the same in almost all districts--declined from 28 mills to 21 mills.

Since 1981-82, disparities in the foundation plus referendum tax rate have declined, following the same trend as the

foundation tax rate. The ratio of the 95th to the 5th percentile has declined from 1.629 in 1981-82 to 1.387 in 1986-87, while the coefficient of variation has declined from .158 to .116. In 1986-87, both the ratio of the 95th to the 5th percentile and the coefficient of variation are very close to the values for 1978-79.

Total school tax rate. Disparities in the total school tax rate have also declined since 1981-82. From 1981-82 to 1986-87, both the ratio of the 95th to the 5th percentile and the coefficient of variation declined. However, disparities in total school tax rates did not decline as much as disparities in foundation tax rates. For example, the coefficient of variation for total school tax rates declined from .153 in 1981-82 to .131 in 1986-87--a drop of .022. Over the same period, the coefficient of variation for the foundation tax rate declined by .056, from .116 to .060.

Tax rate for all jurisdictions. Data on the tax rate for all jurisdictions were readily available only for 1985-86. Thus, no analysis of trends is possible. However, these data do help to illustrate an important point. As more categories of taxes are added, the degree of disparities in tax rates increases. For example, in 1985-86, the coefficient of variation was .070 for the foundation tax rate, .124 for the foundation plus referendum tax rate, .136 for the total school tax rate, and .142 for the tax rate for all jurisdictions. This result is not surprising. The foundation formulas are intended to equalize tax rates; but the referendum levy is totally unequalized, as are several other

school district levies. And the state does not attempt to equalize taxes for counties, towns, and other local governments to the extent that it equalizes school district taxes.

Net Tax Rates

Table 6 contains the same data as Table 5, but it is based on net tax rates, rather than gross tax rates. Data were included only for three years (1983-84, 1985-86, and 1986-87), and no data were available on the net tax rate for all jurisdictions.

Data on net tax rates may be somewhat misleading, due to limitations in the methodology used. Net taxes are, by definition, the gross taxes for any particular levy minus the portion of the state-paid tax credits attributable to the same levy. Net tax rates are then computed as if the credits were spread evenly across all property. Since credits are actually targeted to specific types of property, this methodology either overstates or understates the true net rate for any piece of property. The true net tax rates for agricultural and homestead property are generally lower than those shown in the table. The true net tax rates for most other types of property are generally higher than those shown in the table.

Despite this limitation, net tax rates give an approximation of the average effective tax rate in each district. Table 6 was included in this report because it gives some indication of the effect of tax credits on equalization of tax rates.

Table 6

Distribution of Net Tax Rates

	1983-84	1985-86	1986-87
NET FOUNDATION TAX RATE			
5th Percentile	13.71	15.20	13.07
Median	20.55	21.47	21.88
95th Percentile	26.51	26.82	26.88
Standard Deviation	4.04	3.71	4.32
Mean	20.32	21.44	21.31
Ratio of 95th to 5th Percentile	1.934	1.764	2.057
Coefficient of Variation	0.199	0.173	0.203
NET FOUNDATION PLUS REFERENDUM TAX RATE			
5th Percentile	13.88	15.66	14.08
Median	21.82	22.82	23.54
95th Percentile	31.03	31.17	31.87
Standard Deviation	5.25	4.89	5.49
Mean	21.86	23.12	23.19
Ratio of 95th to 5th Percentile	2.236	1.990	2.263
Coefficient of Variation	0.240	0.212	0.237
NET TOTAL SCHOOL TAX RATE			
5th Percentile	18.12	21.69	19.65
Median	30.58	33.53	35.94
95th Percentile	38.35	40.97	42.24
Standard Deviation	6.25	6.41	7.70
Mean	29.38	32.66	33.50
Ratio of 95th to 5th Percentile	2.116	1.889	2.150
Coefficient of Variation	0.213	0.196	0.230

Two major observations may be made from the data in Table 6. The first is that disparities in net tax rates are much greater than disparities in gross tax rates. This is true for all three tax rates and all three years. For example, for the net

foundation tax rate in 1986-87, the ratio of the 95th to the 5th percentile is 2.057 and the coefficient of variation is .203. The corresponding figures for the gross foundation tax rate are 1.190 and .060. This observation can be explained by the fact that the impact of tax credits varies among districts, based on variations in the types of property. Even if all districts had the same gross tax rates, districts with large proportions of agricultural and homestead property would have lower net rates than districts with more of other types of property.

The second observation from Table 6 is that disparities in net tax rates increased between 1985-86 and 1986-87; this is true for all three tax rates and for both summary measures of dispersion. This result, which contradicts the trend in gross tax rates, was probably caused by changes in the credit formulas.

Conclusions

This chapter has analyzed the degree of disparities among districts in several different categories of tax rates. Generally, the trend in tax rate disparities has been very similar to the trend in revenue disparities, which was described in the previous chapter. Disparities in the gross foundation plus referendum tax rate declined between 1972-73 and 1978-79, then increased between 1978-79 and 1981-82. Since 1981-82, the degree of disparities has declined for all three gross tax rates. In 1986-87, the degree of disparities in the gross foundation plus referendum tax rate is approximately the same as it was in 1978-79.

There is relatively little difference among districts in their gross foundation tax rates. In 1986-87, for example, the 95th percentile (33.18 mills) is only 19 percent higher than the 5th percentile (27.88 mills). But as more categories of taxes are added, the degree of disparities in tax rates increases. Furthermore, disparities in the total school tax rate have not declined as much since 1981-82 as have disparities in the foundation tax rate.

Net tax rates vary among districts more than gross tax rates, due to the varying impact of credits on different types of districts. Disparities in net tax rates increased from 1985-86 to 1986-87.

VI. RELATIONSHIP OF REVENUE TO TAX RATES

In the preceding chapter, tax equity among school districts was viewed in terms of disparities in tax rates. However, tax rate disparities alone do not necessarily indicate school finance inequities; they may simply reflect differing tastes among districts for educational services. This chapter explores tax equity among school districts from another point of view, by assessing the extent to which revenue differences are associated with tax rate differences.

An important school finance concept is that of fiscal neutrality (also called wealth neutrality). An education finance system is fiscally neutral if revenue differences are independent of the wealth of the district, and reflect only differences in effort among districts.[1] Equal tax effort among districts will result in equal revenue yield, and unequal tax effort will result in proportionately unequal amounts of revenue.[2] Therefore, if the Minnesota education finance system is fiscally neutral, the analysis in this chapter should reveal a strong relationship between revenue and tax rates. At the same time, the relation-

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[1] Stephen J. Carroll, "The Search for Equity in School Finance," in Financing Education: Overcoming Inefficiency and Inequity, Walter W. McMahon and Terry G. Geske (eds.) (Urbana, Ill.: University of Illinois Press, 1982), p. 243.

[2] Robert Berne and Leanna Stiefel, The Measurement of Equity in School Finance: Conceptual, Methodological, and Empirical Dimensions (Baltimore: The Johns Hopkins University Press, 1984), pp. 42, 104.

ship of wealth to both revenue and tax rates should be weak; these relationships will be explored in Chapters VII and VIII.

The results in this chapter cannot be compared with earlier years covered in the 1983 study, because the same analysis was not undertaken then.

Revenue per WADM by Tax Rate Decile

For Table 7, school districts were arranged in ascending order according to their gross tax rate for foundation and referendum levies. The districts were then divided into ten groups, or deciles, with each group containing as nearly as possible an equal number of pupils. The weighted mean foundation and referendum revenue per WADM was then computed for each decile. Comparing the mean revenue amount for each decile enables one to observe the relationship between the tax rate and revenue per WADM.

The results are somewhat mixed, although there is a clear tendency for low tax rate deciles to have low average revenue per WADM, and for high tax rate deciles to have high average revenue per WADM. Table 7 displays the foundation plus referendum revenue per WADM for each year for each decile.

In every one of the five years analyzed, the decile of districts with the highest tax rates (Group 10) also had the highest amount of foundation plus referendum revenue. The decile with second highest tax rate in every year (Group 9) had the second or third highest amount of foundation plus referendum revenue each year. At the other end of the scale, the decile

Table 7

Relationship of Foundation Plus Referendum Revenue to Tax Rates

Decile (Based on Foundation Plus Referendum Tax Rate)	Foundation Plus Referendum Tax Rate and Revenue*														
	1981-82			1983-84			1984-85			1985-86			1986-87		
	Tax Rate	Revenue	Rank in Revenue	Tax Rate	Revenue	Rank in Revenue	Tax Rate	Revenue	Rank in Revenue	Tax Rate	Revenue	Rank in Revenue	Tax Rate	Revenue	Rank in Revenue
1 (lowest rate)	20.42	$1444	9	24.89	$1665	10	26.37	$1763	10	26.85	$2011	9	28.66	$2131	10
2	21.55	1412	10	27.04	1717	9	28.30	1812	9	28.77	1989	10	29.93	2431	3
3	22.23	1465	8	28.02	1769	8	28.97	1820	8	29.39	2240	4	30.16	2406	6
4	22.86	1496	7	28.78	2076	4	29.25	2104	2	29.79	2226	5	30.58	2211	9
5	23.65	1578	6	29.29	2072	5	29.85	2089	4	30.37	2068	8	31.46	2303	8
6	24.32	1876	2	30.79	1930	6	31.13	2004	6	32.01	2139	7	32.96	2409	5
7	25.60	1606	5	32.76	1909	7	32.61	2088	5	34.03	2211	6	34.95	2396	7
8	27.64	1667	4	33.71	2113	2	33.61	1965	7	35.22	2323	3	36.20	2427	4
9	29.10	1708	3	35.56	2077	3	35.14	2101	3	37.12	2413	2	37.79	2550	2
10 (highest rate)	33.60	1890	1	41.03	2371	1	38.54	2327	1	40.64	2533	1	41.56	2801	1
Mean	25.28	1624		31.20	1971		31.65	2023		32.19	2208		33.26	2398	

*Tax rates in the table are weighted mean tax rates, in EARC mills, for all districts in each decile. Revenue figures are weighted mean revenue per [illegible]

with the lowest tax rate (Group 1) had the lowest or second lowest rank in foundation plus referendum revenue each year.

Correlation Analysis

The relationship between tax rates and revenue was also analyzed by using correlation analysis. Simple linear correlations were performed, using two pairs of variables. For the first pair, the independent variable was the foundation plus referendum tax rate, and the dependent variable was foundation plus referendum revenue per WADM. The second pair of variables was the foundation tax rate and foundation revenue per WADM. The results are shown in Table 8.

Table 8

Correlation of Tax Rates with Revenue per WADM

Independent Variable	Dependent Variable		1981-82	1983-84	1984-85	1985-86	1986-87
Foundation plus Referendum Tax Rate	Foundation plus Referendum Revenue per WADM	Slope	38.936	40.127	33.217	38.877	41.308
		R^2	.4880	.3981	.3403	.4567	.4347
Foundation Tax Rate	Foundation Revenue	Slope	32.327	23.590	18.474	21.493	26.571
		R^2	.2482	.1782	.1772	.1776	.1323

For the first pair of variables, shown in the top half of Table 8, the slope indicates the amount by which foundation plus referendum revenue per WADM would be expected to increase, given a one-mill increase in the corresponding tax rate. For 1981-82, for example, a district with a tax rate of 40 EARC mills would be

expected to have $38.94 more revenue per WADM than a district with a tax rate of 39 mills. The slope is fairly consistent over all five years studied, ranging from 33.217 to 41.308.

The R^2 statistic indicates the extent to which variations in the independent variable explain variations in the dependent variable. Thus, for 1981-82, the R^2 result of .4880 means that 48.80 percent of the variation in foundation plus referendum revenue per WADM is explained by differences among districts in the foundation plus referendum tax rate. The values of R^2 for the first pair of variables indicate that the tax rate explains from 34.03 to 48.80 percent of the variation in revenue per WADM. These are consistently high values for R^2, meaning that the relationship between foundation plus referendum tax rates and revenue is a strong one.

For the second pair of variables in Table 8, the slope indicates the extent to which foundation revenue would be expected to increase, given a one-mill increase in the district's foundation tax rate. Thus, for 1981-82, a district with a foundation tax rate of 31 mills would be expected to have $32.33 more revenue per WADM than a district with a foundation tax rate of 30 mills. The slope decreased between 1981-82 and 1984-85, but then increased for the next two years. These changes in slope are primarily due to changes in the equalizing factors for foundation revenues.

The R^2 statistic for the second pair of variables in Table 8 decreased from .2482 in 1981-82 to .1323 in 1986-87. This means that variations in foundation tax rates in 1986-87 explain less

of the variation in foundation revenue than they did in the earlier years.

It is interesting to compare these results with the results for the first pair of variables, where referendum tax rates and revenue were included. If referendum tax rates and revenue are included, the slope is greater, i.e., a given change in tax rate results in a greater expected change in revenue per WADM than if referendum tax rates are not included. Further, the R^2 statistic shows that, if referendum tax rates and revenue are included, variation in the tax rate explains a much larger portion of the variation in revenue per WADM.

Conclusions

This chapter indicates that districts with higher foundation tax rates have higher amounts of foundation revenue per pupil. Not surprisingly, the results are even more pronounced when referendum revenue and tax rates are included.

The results in this chapter do not give a clear indication of whether the Minnesota school finance system is equitable. The relationship between tax rates and revenue, by itself, is not enough to determine whether the system is equitable. These results must be read in tandem with other characteristics, particularly the relationships of both tax rates and revenues to wealth.

VII. RELATIONSHIP OF REVENUE TO PROPERTY WEALTH

The previous chapter introduced the concept of fiscal neutrality. One of the indicators of fiscal neutrality is the relationship of revenue to property wealth. Ideally, this relationship should be very weak. If wealthier districts have significantly more revenue per pupil than poorer districts, the education finance system may be inequitable.

In fact, the relationship of wealth to revenue is perhaps the most critical component of both research and litigation on education finance equity. In its 1971 decision in Serrano v. Priest, the California State Supreme Court established a standard that can be paraphrased as follows: the quality of a pupil's education may not be dependent on the wealth of the school district in which the pupil lives.[1] This standard, sometimes called the "Serrano principle," has been the basis of subsequent litigation in California and in other states. Since quality of education is nearly impossible to define and measure, per-pupil revenues or expenditures are often used as a substitute measure. Thus, compliance with the Serrano principle is most often measured by examining the relationship between revenues or expenditures per pupil and property wealth per pupil.

This chapter examines the relationship of revenue per WADM--

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[1] Walter I. Garms, James W. Guthrie, and Lawrence C. Pierce, School Finance: The Economics and Politics of Public Education (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1970), p. 217.

both foundation revenue and foundation plus referendum revenue--to property wealth, measured by EARC value per WADM.

Revenue Per WADM by Property Wealth Deciles

Table 9 shows the relationship between foundation plus referendum revenue per WADM and EARC per WADM. For each year in the table, districts were ranked by EARC per WADM, and then placed in ten groups. Each group has approximately the same number of WADM. Group 1 is the districts with the lowest property valuation per WADM, and Group 10 is the wealthiest districts. In 1986-87, the average EARC value per WADM varied from $16,993 in Group 1 to $74,210 in Group 10.

The table shows a clear positive relationship between revenue and property wealth. Group 10 (the wealthiest districts) has the highest revenue per pupil in all seven years. With few exceptions, revenue per pupil increases as the group number increases. For example, Group 5 has greater revenue than Group 4 in six of the seven years. Group 8 has higher revenue than Group 7 in all seven years.

Thus, wealthy districts have, on average, more revenue per WADM than poorer districts. In 1972-73, the average revenue per WADM in Group 10 ($876) was 23.4 percent higher than the average in Group 1 ($710). The gap between Group 10 and Group 1 grew to 30.4 percent by 1981-82, and then declined, reaching 24.0 percent by 1986-87.

Table 9

Relationship of Foundation plus Referendum Revenue

to Property Wealth (EARC/WADM)

Decile (Based on Property Wealth per WADM)	Foundation plus Referendum Revenue per WADM													
	1972-73		1978-79		1981-82		1983-84		1984-85		1985-86		1986-87	
	Revenue	Rank	Revenue	Rank	Revenue	Rank	Revenue	Rank	Revenue	Rank	Revenue	Rank	Revenue	Rank
1 (lowest wealth)	$710	9	$1164	10	$1460	10	$1806	9	$1871	10	$2057	9	$2259	7
2	696	10	1173	8	1493	8	1795	10	1877	9	2039	10	2299	6
3	758	8	1173	8	1486	9	1807	8	1889	8	2097	6	2226	10
4	762	7	1209	7	1579	7	1877	6	1913	7	2076	7	2230	9
5	794	6	1222	5	1587	6	1928	5	1930	6	2068	8	2251	8
6	804	5	1253	4	1627	5	1849	7	1951	5	2165	5	2335	5
7	817	4	1215	6	1652	4	2023	4	2017	4	2257	4	2361	4
8	826	3	1282	3	1660	3	2066	3	2102	3	2297	3	2501	3
9	873	2	1377	2	1798	2	2183	2	2260	2	2453	2	2644	2
10 (highest wealth)	876	1	1467	1	1904	1	2318	1	2397	1	2566	1	2801	1
Mean	794		1253		1624		1971		2023		2208		2398	
Ratio of Group 10 to Group 1	1.234		1.260		1.304		1.283		1.281		1.247		1.240	

[illegible] Revenue per WADM.

Table 10 contains the same breakdowns as Table 9, but it is based on foundation revenue per WADM, excluding referendum revenue. Data for 1972-73 and 1978-79 were not available for this revenue total. Table 10 shows that when referendum revenue is excluded, there still appears to be a relationship between revenue and property wealth. But the relationship is not as strong or as clear as it was when referendum revenue was included. Group 10 has the highest per-pupil revenue in all five years. But the differences in revenue, particularly among Groups 1 through 8, are smaller than the differences shown in Table 9. For example, in 1985-86, per-pupil revenue in Group 3 ($2,070) is nearly the same as in Groups 6, 7, and 8.

The revenue differences are especially small in the 1986-87 school year. Per-pupil revenue in Groups 1 and 2 (the lowest wealth groups) is actually higher than in Groups 5 and 6, and the variation in per-pupil revenue among Groups 1 through 8 is less than $100. Only Groups 9 and 10 have significantly higher revenue than the other groups.

Table 10

Relationship of Foundation Revenue, Not Including Referendum,

to Property Wealth (EARC/WADM)

Decile (Based on Property Wealth per WADM)	Foundation Revenue per WADM									
	1981-82		1983-84		1984-85		1985-86		1986-87	
	Revenue	Rank	Revenue	Rank	Revenue	Rank	Revenue	Rank	Revenue	
1 (lowest wealth)	$1456	10	$1771	8	$1842	9	$2026	8	$2216	
2	1489	8	1746	10	1809	10	1980	10	2239	
3	1471	9	1750	9	1871	6	2070	6	2189	
4	1578	6	1852	5	1844	8	2016	9	2173	
5	1560	7	1827	6	1871	6	2027	7	2201	
6	1583	4	1797	7	1884	5	2073	5	2205	
7	1583	4	1898	4	1924	4	2083	3	2237	
8	1634	3	1902	3	1932	3	2077	4	2263	
9	1762	2	2105	2	2132	2	2306	2	2430	
10 (highest wealth)	1822	1	2132	1	2203	1	2368	1	2528	
Mean	1593		1882		1933		2104		2274	
Ratio of Group 10 to Group 1	1.251		1.204		1.196		1.169		1.141	

NOTE: Revenue figures in the table are weighted averages, for all districts in each decile, of foundation revenue per WADM.

Bivariate Gini Coefficients

Table 11 provides some statistical measures of the link between revenue and wealth, based on foundation revenue both with and without referendum revenue. The first measure shown in the table is the bivariate Gini coefficient, which is a complex mathematical measure of the extent to which per-pupil revenue is related to per-pupil wealth. (Computation of the bivariate Gini coefficient is explained in Appendix 2.) If all districts had the same per-pupil revenue, the coefficient would be zero. A negative coefficient would show that poorer districts, in general, have more revenue than wealthier districts. In most education finance analyses the bivariate Gini coefficient is positive, indicating a positive relationship between revenue and wealth. Smaller values indicate a weaker relationship (i.e., improved fiscal neutrality).

The first set of Gini coefficients, based on foundation plus referendum revenue, has not varied much since 1972-73. The value was .042 in 1972-73, declined to .038 in 1978-79, and then increased again to .045 in 1981-82 and .048 in 1983-84. Since 1983-84, the value has declined slightly, reaching .041 in 1986-87. This pattern is very similar to the trends in overall

Table 11

Statistical Measures of Relationship of

Revenue per WADM to EARC per WADM

	1972-73	1978-79	1981-82	1983-84	1984-85	1985-86	1986-7
Foundation plus Referendum Revenue per WADM:							
Bivariate Gini Coefficient	.042	.038	.045	.048	.045	.042	.041
Slope			.0084	.0089	.0076	.0084	.01
R^2			.3243	.3258	.2719	.2772	.31
Foundation Revenue, Excluding Referendum, per WADM:							
Bivariate Gini Coefficient			.038	.036	.032	.026	.03
Slope			.0034	.0023	.0012	Not significant	
R^2			.1245	.0740	.0251		

disparities in foundation plus referendum revenue per WADM, as described in Chapter IV. The degree of disparities declined between 1972-73 and 1978-79, then increased through 1983-84, and declined after the tier formula became effective in 1984-85.

When referendum revenue is excluded, the bivariate Gini coefficient shows a somewhat different pattern. The values are lower, showing a weaker link between revenue and wealth. And the coefficient shows greater improvement, declining from .038 in

1981-82 to .022 in 1986-87, a drop of .016. By comparison, when referendum revenue was included the coefficient declined by only .004 (from .045 to .041) over the same period.

Correlation Analysis

Table 11 also shows results of linear correlations. The results of the correlation of EARC value per WADM (independent variable) and foundation plus referendum revenue per WADM (dependent variable) show a strong and consistent relationship. The value of R^2 varies from .2719 to .3352. This means that variations in EARC per WADM explain 27.19 percent to 33.52 percent of the variations in revenue per WADM. The slope is also very consistent, ranging from a low of .0076 in 1984-85 to a high of .0104 in 1986-87. The slope of .0104 for 1986-87 means that each $1,000 increment in EARC per WADM could be expected to increase revenue by $10.40 per WADM.

When EARC per WADM is correlated with foundation revenue per WADM (excluding referendum), the results are very different. In the first three years there is a significant relationship between the two variables, but it is not as strong as the relationship when referendum revenue is included. The value of R^2 ranges from .0251 to .1245. The slope is also lower, ranging from .0012 to .0034.

In 1985-86 and 1986-87, the correlation analysis reveals no statistically significant relationship between EARC and foundation revenue per WADM.

Conclusions

If referendum revenue is ignored, the current Minnesota foundation revenue system comes very close to satisfying the Serrano principle. Although the wealthiest districts do receive more revenue per WADM, on average, than other districts, revenue differences among most districts are quite small. For the poorest group of districts, as shown in Table 10, revenue per WADM in 1986-87 is only $58 less than the state average. The bivariate Gini coefficient is very low and has declined significantly since 1983-84. And there is no significant correlation between EARC and revenue per WADM. The fiscal neutrality of the system has improved markedly since 1983-84, apparently due to the tier system.

But the referendum levy provides more revenue to wealthy districts than to poorer ones. Thus, the increasing use of the referendum levy has countered the improvements in the fiscal neutrality of foundation revenue. When referendum revenue is included, the bivariate Gini coefficient shows relatively little improvement between 1983-84 and 1986-87; the value in 1986-87 is still higher than it was in 1978-79 and is about the same as in 1972-73. Correlation analysis reveals a strong and consistent relationship between EARC and foundation plus referendum revenue per WADM.

VIII. RELATIONSHIP OF TAX RATES TO PROPERTY WEALTH

The relationship between tax rates and school district property wealth is often one of the focal points of discussions of school finance equity. It is generally thought to be undesirable to have wide disparities in tax rates among districts, even when such disparities reflect true differences among taxpayers and consumers in the amounts of educational services they desire. It is even less desirable to have disparities in tax rates that are closely correlated with school district wealth. If low-wealth districts have unusually high tax rates, it may be due to an education finance structure that provides too little equalization aid, so that low-wealth districts must tax themselves excessively in order to provide educational programs. On the other hand, if low-wealth districts have inordinately low tax rates, it may be that such districts simply do not have access to levies to which wealthier districts have access. The lack of access may be due to legal restrictions, because the districts do not meet the criterion specified in law, e.g., certain grandfathering requirements. Or the lack of access may be due to economic, political, sociological, or other factors that effectively preclude access to revenues, e.g., the difficulty that extremely low-wealth districts have in passing referendum levies.

In this chapter, the relationship between school district property valuation per pupil and school district tax rates is explored. In the first section, the districts were sorted in ascending order by adjusted assessed valuation (EARC) per WADM,

and were again divided into ten pupil groups, or deciles, each with approximately the same number of pupils. The unweighted mean tax rate was then determined for each decile. The tax rate was computed in several forms. In the second section, correlation analysis was conducted for each study year with adjusted assessed valuation per WADM as the independent variable, and with two separate dependent variables: the district's foundation tax rate, and the district's total school tax rate.

Tax Rates by Property Wealth Deciles

Table 12 shows the tax rate and the rank of each decile's tax rate for the 1985-86 school year. Seven different tax rates are presented.

-- Gross foundation tax rate
-- Gross foundation plus referendum tax rate
-- Gross total school tax rate
-- Gross tax rate for all taxing jurisdictions (city, county, town, school district, etc.) by school district
-- Net foundation tax rate
-- Net foundation plus referendum tax rate
-- Net total school tax rate

The tax rate shown for each decile is the weighted mean for that decile. The rank of each decile's tax rate in comparison to the other deciles is also shown.

Tax rates by property wealth deciles were also computed for other years studied. Since the analysis showed very little

Table 12

Relationship of Tax Rates to Property Wealth

1985-86 School Year

Decile (Based on Property Wealth per WADM)	Tax Rates*											
	Gross Foundation Tax Rate & Rank		Gross Foundation plus Referendum Tax Rate & Rank		Gro. Total School Tax Rate & Rank		All Taxing Jurisdictions Gross Tax Rate & Rank		Net Foundation Tax Rate & Rank		Net Foundation plus Referendum Tax Rate & Rank		Net Total School Tax Rate & Rank	
1 (lowest wealth)	28.52	10	29.33	10	51.59	1	103.32	1	17.41	10	17.87	10	31.90	9
2	28.93	8	31.57	6	48.58	2	90.83	3	19.90	8	21.81	7	33.54	2
3	29.24	7	29.81	9	46.92	4	100.40	2	20.16	7	20.52	9	32.56	7
4	29.68	6	31.86	5	46.94	3	90.15	4	20.87	6	22.49	6	33.10	6
5	29.99	5	31.18	7	43.99	8	85.99	6	19.77	9	20.57	8	29.01	10
6	31.26	1	33.81	3	45.58	6	85.60	8	22.74	4	24.60	5	33.24	4
7	31.03	2	35.12	1	46.14	5	84.87	9	22.24	5	25.29	3	33.20	5
8	30.86	4	35.05	2	44.52	7	84.24	10	23.01	3	26.21	2	33.29	3
9	30.88	3	33.18	4	43.59	9	88.38	5	24.68	1	26.45	1	34.83	1
10 (highest wealth)	28.67	9	31.03	8	39.28	10	85.99	6	23.41	2	25.21	4	31.99	8
Mean	29.91		32.19		45.66		89.88		21.44		23.12		32.66	

*All tax rates are in [illegible].

change over time, the results for other years were placed in Appendix 1, in the interest of brevity. Table 12 is a summary table showing the results for 1985-86 only, the year for which the most complete set of data were available.

For the gross foundation tax rate in 1985-86, there is not much variation among the groups. There is a slight tendency for lower-wealth deciles to have lower tax rates than higher-wealth deciles. A notable exception is that the decile with the greatest wealth (group 10) had the second-lowest tax rate. The lowest-wealth decile (group 1) had the lowest tax rate. The four lowest-wealth deciles (groups 1 to 4) all had mean tax rates below the statewide mean, while deciles 6 through 9 all had tax rates above the mean.

With regard to the gross foundation plus referendum tax rate, lower-wealth deciles again tend to have lower tax rates, while higher-wealth deciles tend to have higher tax rates. Group 1 had the lowest tax rate, and the five lowest-wealth deciles all had tax rates below the statewide mean. With the exception of Group 10, the five wealthiest deciles all had tax rates above the statewide mean. Group 10, the wealthiest decile, again is a notable exception to the general trend, having the third-lowest tax rate.

For the gross total school tax rate, the situation is reversed: lower-wealth deciles tend to have higher tax rates, and higher-wealth deciles have lower rates. The total school tax rate includes levies for debt service, capital expenditures, and a number of other purposes for which little or no state

equalization aid is provided. The two lowest-wealth deciles have the highest tax rates, and the two highest-wealth deciles have the lowest tax rates.

As to the gross tax rate for all taxing jurisdictions, the lower-wealth deciles again tend to have higher tax rates. Groups 1 to 4, the four lowest-wealth deciles, have the four highest tax rates, and all four deciles have tax rates above the statewide mean. The six highest-wealth deciles all have tax rates below the statewide mean.

In the case of the net foundation tax rate, low-wealth deciles tend to have low tax rates, and high-wealth districts tend to have high tax rates. The five lowest-wealth deciles all have tax rates below the statewide mean, and the five highest-wealth deciles all have tax rates above the statewide mean.

For the net foundation plus referendum tax rate, the pattern is very similar. Low-wealth deciles tend to have low tax rates, with the five lowest-wealth deciles all having tax rates below the statewide mean. High-wealth deciles tend to have high tax rates, with the five highest-wealth deciles all having tax rates above the statewide mean.

With regard to the net total school tax rates, the results are mixed, and the pattern is not a clear one. High tax rates are found among both higher-wealth and lower-wealth deciles, as are low tax rates. In general, higher-wealth deciles have higher tax rates and lower-wealth deciles have lower tax rates, but there are significant aberrations.

Correlation Analysis

Table 13 shows the results of the correlation analysis performed with adjusted assessed valuation (EARC) per WADM as the independent variable, and with two separate dependent variables: gross foundation tax rate, and gross total school tax rate. For the foundation tax rate, the slope indicates the degree to which a difference in EARC per WADM would be expected to change the foundation tax rate. For example, for the 1981-82 school year, an increase in EARC per WADM of $1,000 would be expected to result in an increase in the foundation tax rate of .03 mills.

Table 13

Correlation of EARC/WADM with Tax Rates

	School Year				
Gross Foundation Tax Rate	1981-82	1983-84	1984-85	1985-86	1986-87
Slope	.00003	-.00003	-.00007	-.00005	-.00004
R^2	.0306	.0487	.1670	.1331	.1135
Gross Total School Tax Rate					
Slope	-.00012	-.00013	-.00018	-.00017	-.00017
R^2	.0780	.1396	.2032	.1876	.1528

The slope of this relationship was positive for only the 1981-82 year. For the other four years studied, the slope was negative, i.e., an increase in EARC/WADM would be expected to result in a decrease in the foundation tax rate. Simply stated, this statistic indicates that in 1981-82 wealthier districts had higher foundation tax rates, but for the other years studied, wealthier districts had lower foundation tax rates. The magnitude of the expected decrease fluctuated, ranging from .03 mill for each $1,000 increase in EARC per WADM in 1983-84, to .07 mill in 1984-85. The reason for the change in the sign of the slope between 1981-82 and 1983-84 is difficult to explain with certainty, but most likely is related to the prominence of the grandfather levy in 1981-82, which accounted for a large portion of districts' excess revenue and was generally used by wealthier districts. With the establishment of the equalized low fund balance levy for 1983-84, and the increase in the equalized discretionary mill rate from 1.0 mills for 1981-82 to 2.5 mills for 1983-84, followed by enactment of the tier formula for 1984-85 and after, the school finance structure added equalized revenue sources which less wealthy districts could obtain.

These findings for the slope of the relationship of the foundation tax rate to EARC per WADM are somewhat contradictory to the findings in the previous section. The analysis of tax rates by property wealth decile indicates that the foundation tax rate tends to be lower for lower-wealth deciles. The correlation analysis indicates that this was true for 1981-82 only, and that for 1983-84 to 1986-87 the opposite is true--lower wealth

districts tend to have higher foundation tax rates. This discrepancy may be due to the fact that the decile analysis is based on weighted statistics and the correlation analysis is based on unweighted statistics. In either case, the relationship between EARC/WADM and foundation tax rate is a weak one.

The R^2 statistic indicates the extent to which variation in the independent variable, EARC per pupil unit, explains variation in the dependent variable, foundation mill rate. For 1981-82, for example, the R^2 result of .0306 means that 3.06 percent of the variation in foundation mill rates is explained by differences in EARC per WADM. The results indicate that EARC per WADM explains from 3.06 percent to 16.70 percent of the variation in foundation mill rates.

Table 13 also contains the results of the correlation analysis for EARC per WADM as the independent variable, and gross total school tax rate as the dependent variable. The results indicate that wealthier districts tend to have lower tax rates. The slope is consistent in direction and is fairly consistent in magnitude. For 1981-82, an increase in EARC per WADM of $1,000 would be expected to result in a decrease in the total school tax rate of .12 mills. For 1983-84, this decrease would be expected to be .13 mills; for 1984-85, .18 mills; and for 1985-86 and 1986-87, .17 mills.

The R^2 statistic shows that EARC per WADM explains 7.8 percent of the variance in the total school district mill rate in 1981-82, and 20.32 percent of the variance in 1984-85. The R^2

results for the other three years studied fall between these two extremes.

Conclusions

The results in this chapter indicate that school district tax rates are related to district wealth. The nature of the relationship and its strength depend upon which tax rate is selected for analysis. For foundation levies only, there is not much variation in gross tax rates that can be associated with EARC per WADM, and the statistical analysis yields inconsistent results. When referendum levies are also included, the relationship is clearer, with lower-wealth districts tending to have lower gross tax rates, and with higher-wealth districts having higher gross tax rates for foundation plus referendum levies.

With regard to gross total school tax rates, there is an inverse relationship between tax rates and wealth, with low-wealth districts having high tax rates. Similarly, when the gross tax rate for other jurisdictions is added to the gross total school tax rate, there is an inverse relationship to wealth, with low-wealth districts having high tax rates, and high-wealth districts having low tax rates.

When tax rates net of credits are analyzed with regard to district wealth, the results are somewhat different. For the net total school tax rate, the relationship between wealth and tax rates is not clear. Net foundation tax rates and net foundation plus referendum tax rates vary directly with wealth, however.

The tendency toward higher foundation plus referendum tax rates in higher-wealth districts is not by itself an indicator of inequity. However, coupled with the fact that higher-wealth districts tend also to have higher revenues, these higher tax rates can be regarded as a source of inequity in the system.

The gross total school tax rate is higher for low-wealth districts, as is the gross tax rate for all jurisdictions. These, too, may indicate a problem with regard to equalization of the education finance system. These rates are higher for low-wealth districts because there is little equalization aid associated with some school district levies, such as those for debt service and capital expenditures; also, levies for other jurisdictions are not fully equalized. Because taxpayers in low-wealth districts pay higher tax rates for school debt service and capital expenditures, as well as other government services, they are less able and less willing to approve referendum levies. As a result, low-wealth districts have less general operating revenue, on average, than high-wealth districts.

IX. SYNTHESIS AND CONCLUSIONS

The primary purpose of this study has been to use statistical analysis to assess the equity of Minnesota's education finance system. There are, however, several obstacles which make this task difficult. The first is that there is not complete agreement, either in Minnesota or nationally, as to what constitutes an equitable education finance system. Furthermore, even when an equity goal is widely accepted and clearly defined, there may be no analytical tool which can accurately measure compliance with the goal. As a result, there is no single measure--or even a group of measures--to which one can point as irrefutable evidence of equity. To draw conclusions about the equity of an education finance system, one must first examine many different statistical measures and then make subjective judgments about the meaning and the relative importance of the various measures.

Although an overall definition of education finance equity is elusive, some aspects of equity can be defined. In general, an equitable education finance system should have the following attributes.

1. Revenue per pupil should not vary too much among districts. Some variations are expected. If the variations are linked to cost differences and to differences in voter preferences, they may be acceptable.
2. Similarly, tax rates should not vary too much among districts, although some variations may be inevitable.

3. There should be a positive relationship between tax rates and revenue per pupil. Districts with higher tax rates should receive more revenue than districts with lower tax rates.
4. Differences in revenue should not be correlated with differences in property wealth. Wealthier districts should not have significantly more revenue than poorer districts.
5. Differences in tax rates also should not be correlated with differences in property wealth. Wealthier districts should not have lower tax rates than poorer districts, nor should they have access to extra property tax levies that are not available to poorer districts.

Each of the previous five chapters was related to one of these five attributes. Chapters IV and V examined disparities in revenue per pupil and tax rates, respectively. Chapter VI explored the relationship between tax rates and revenue. Chapters VII and VIII analyzed the relationships of revenue and property taxes to property wealth.

This final chapter integrates and summarizes the most important findings from all of the previous chapters. The findings are organized under four general statements about the equity of Minnesota's education finance system.

1. The equity of Minnesota's education finance system has improved in recent years.

There are several signs of improvement. Disparities in revenue per WADM have decreased steadily since 1983-84, as shown in Chapter IV. Although there are still significant variations among districts in foundation revenue per WADM, the overall level of disparities is lower now than at any other time in the '80s. Adding referendum revenue to the data increases the degree of disparities but it does not change the trend.

Disparities in gross tax rates have also decreased, as explained in Chapter V. This is particularly true for the gross foundation tax rate, excluding referendum levies. As of 1986-87, variations among districts for this tax rate are very small. The foundation plus referendum tax rate and total school tax rate vary more among districts; but the overall level of disparities has decreased since 1981-82 for both of these rates.

Another important sign of improved equity comes from Chapter VII, which analyzed the relationship of revenue to property wealth. The relationship of foundation revenue per WADM (excluding referendum) to EARC per WADM has weakened considerably since 1981-82. In 1986-87, the wealthiest districts still receive, on average, more foundation revenue per WADM than poorer districts. But revenue differences among most districts are small, and correlation analysis reveals no significant relationship between foundation revenue and EARC per WADM.

The chief cause of these improvements appears to be the implementation of the tier system, which began in 1984-85. The expansion of discretionary revenue in the early '80s also helped to reduce disparities.

2. <u>These recent improvements mark a reversal of an earlier trend toward increasing disparities</u>.

Chapters IV and V showed that, from 1972-73 to 1978-79, disparities among districts in both revenue per WADM and tax rates decreased. But after 1978-79, disparities began to increase again.

Disparities in <u>foundation plus referendum revenue</u> per WADM increased significantly between 1978-79 and 1983-84. Disparities in the gross <u>foundation plus referendum tax rate</u> increased between 1978-79 and 1981-82, then remained about the same between 1981-82 and 1983-84. By 1986-87, the level of disparities in both of these variables (foundation plus referendum revenue per WADM and the gross foundation plus referendum tax rate) was about the same as it had been in 1978-79.

These trends could be interpreted in two very different ways. One interpretation is that the period around 1980 was a temporary setback in a long-term trend toward greater equality in school district revenues and tax rates. The second interpretation is that, despite the improvements of the last three to five years, both revenues and tax rates are no more equal now than they were in 1978-79.

3. Despite the recent improvements, there are still signs of inequities.

Although disparities in revenue per WADM and tax rates have been reduced, significant disparities still exist. These continuing disparities are not, by themselves, proof of inequities. The more telling evidence, contained in Chapters VII and VIII, concerns the relationship between property wealth and both revenue and tax rates.

Table 14 incorporates a form of analysis used throughout the report. Districts were ranked based on EARC value per WADM in the 1986-87 school year, and then divided into ten groups (or deciles), each with approximately the same number of WADM. Group 1 is the districts with the lowest EARC per WADM, and Group 10 is the districts with the highest EARC per WADM. For each group, the table shows weighted means of EARC per WADM and several categories of revenue per WADM and gross tax rates. All data are for the 1986-87 school year.

As reported earlier, there is not a strong relationship between foundation revenue per WADM and property wealth. However, referendum revenue is closely correlated with property wealth. Referendum revenue per WADM varies from a low of $37 in Group 3 to a high of $273 in Group 10. As a result, wealthier districts have a large advantage over poorer districts in terms of total general operating revenue. Foundation plus referendum revenue per WADM is below the state average in all of Groups 1 through 7, and above the state average in Groups 8, 9, and 10.

The average revenue per WADM in Group 10 is more than $400 above the state average, and more than $500 above the average for each of Groups 1 through 5.

In fact, the relationship between revenue and property wealth may be as strong now as it was in 1972-73. In Chapter VII, the relationship between foundation plus referendum revenue per WADM and EARC per WADM was analyzed using a measure called the bivariate Gini coefficient. Although the value of this coefficient has declined somewhat since 1983-84, the value in 1986-87 is nearly the same as it was in 1972-73, and it is higher than in 1978-79.

Table 14 also shows that there is a relationship between tax rates and property wealth. Although foundation tax rates do not vary much among the ten groups shown in Table 14, referendum levies are more common in wealthier districts. Thus, the foundation plus referendum tax rate tends to be somewhat higher in wealthier districts than in poorer districts. But the opposite is true of the total school tax rate. The total school tax rate is above the state average in the four lowest-wealth deciles (Groups 1 through 4) and below the state average in the six wealthiest deciles (Groups 5 through 10). The rate in Group 10 is 5.20 mills below the state average, and 10.79 mills below the rate for Group 1.

Thus, districts with high property wealth have a double advantage. They have more revenue than poorer districts, and they have lower overall tax rates. The advantage in revenue is attributable primarily to the referendum levy. The lower overall

Table 14

1986-87 Revenue and Tax Rates

by Property Wealth Deciles

Decile (Based on Property Wealth per WADM)	EARC Value per WADM	Revenue per WADM			Gross Tax Rates			
		Foundation	Referendum	Found. + Ref.	Foundation	Referendum	Found. + Ref.	Total School
1 (low wealth)	$16,993	$2216	$ 43	$2259	29.67	1.06	30.73	53.73
2	21,517	2239	60	2299	30.53	2.62	33.15	51.25
3	24,709	2189	37	2226	30.39	1.22	31.61	48.99
4	27,567	2173	57	2230	30.40	1.90	32.30	49.52
5	30,413	2201	50	2251	30.93	1.66	32.59	46.02
6	35,558	2205	130	2335	30.96	3.61	34.57	48.12
7	41,078	2237	124	2361	31.72	2.95	34.67	46.97
8	48,325	2263	238	2501	31.72	4.76	36.48	47.66
9	57,874	2430	214	2644	30.63	3.52	34.15	47.47
10 (high wealth)	74,210	2528	273	2801	29.75	3.29	33.04	42.94
Mean	38,483	2274	124	2398	30.63	2.63	33.26	48.14

NOTE: All data are weighted means for the districts in each decile. Tax rates are in EARC mills.

tax rates are attributable to lower tax rates for various levies, particularly the capital expenditure and debt service levies.

4. It is very difficult for districts with low property wealth to raise significant revenue through the referendum levy.

Differences in referendum revenue among districts may be partially attributable to differences in preferences. Taxpayers in some districts are willing to pay higher taxes for education, while taxpayers in other districts are not willing to do so. But the big differences among the wealth groups shown in Table 14 suggest that more is involved than differing preferences. In fact, there are two barriers which make it difficult for districts with low property wealth to pass referendum levies.

The first barrier is that tax rates are already quite high in most low-wealth districts. Thus, voters may be more reluctant to approve additional taxes than voters in wealthier districts. Table 15 contains additional summary data by property wealth decile for the 1986-87 school year. It shows that the gross total school tax rate, not including referendum levies, is 52.67 mills in Group 1 (the lowest wealth decile). This is more than seven mills above the state average, and 13 mills above the comparable rate for Group 10 (the wealthiest districts). In fact, the total school tax rate, not including referendum levies, is above the state average in Groups 1 through 4, and below the state average in Groups 5 through 10. Thus, before taxpayers in

low-wealth districts even consider approving a referendum levy, they are already paying relatively high tax rates.

The second barrier that low-wealth districts face in use of the referendum levy is that the yield is very low; i.e., a low-wealth district receives much less revenue for each mill than a high-wealth district receives. Table 15 shows the average referendum levy revenue that districts would receive from a one mill levy, by property wealth decile (these revenue figures do not include taconite referendum aid). The average revenue is $17 for Group 1; this is less than half of the statewide average ($38), and less than one-fourth of the average for Group 10 ($74). Another use of the data may help to illustrate the point further. The average tax rate needed to raise $300 per WADM in referendum levy revenue is 17.7 mills for districts in Group 1, compared with 4.0 mills for districts in Group 10; the average for all districts statewide is 7.8 mills.

The referendum levy is an important source of revenue for Minnesota school districts. Half of the state's school districts have referendum levies, which allow them to make valuable improvements in their education programs. Yet, because of the two barriers described above, it is very difficult for most low-wealth districts to make referendum levies.

The result is that few low-wealth districts have referendum levies. The proportion of districts with referendum levies is over half in Groups 5 through 10, and over 80 percent in Groups 9 and 10. But in Groups 1 through 3, only about one-fourth of the districts have referendum levies. The statistics for the lowest-

Table 15

Summary Data Related to Referendum Levies

1986-87 School Year

Decile (Based on Property Wealth per WADM)	EARC Value per WADM	Gross Total School Tax Rate, Not Including Referendum	Average Referendum Levy per WADM per Mill	Number of Districts	
				Total	With Referendum
1 (lowest wealth)	$16,993	52.67	$17	59	15 (25%)
2	21,517	48.63	22	22	6 (27%)
3	24,709	47.77	25	58	14 (24%)
4	27,567	47.62	28	22	7 (32%)
5	30,413	44.36	30	45	16 (36%)
6	35,558	44.51	36	55	34 (62%)
7	41,078	44.02	41	50	27 (54%)
8	48,325	42.90	48	39	27 (69%)
9	57,874	43.95	58	53	44 (83%)
10 (highest wealth)	74,210	39.65	74	32	27 (84%)
Mean	38,483	45.51	38	435	217 (50%)

NOTE: All data, except for numbers of districts, are weighted averages for all districts in each decile. "Referendum levy per WADM per mill" is the average potential levy revenue (not including taconite referendum aid) from a levy of one EARC mill, for all districts in each decile.

wealth deciles are distorted somewhat by the presence of taconite districts, which receive equalization aid from taconite tax proceeds if they make referendum levies. Because of this equalization aid, all taconite districts have chosen to make referendum levies. Of the 15 districts in Group 1 that have referendum levies, nine are taconite districts. Thus, of the 50 non-taconite districts in Group 1, only six (or 12 percent) have referendum levies.

* * * * * * * * * * * * *

The statistical analysis conducted for this study has yielded some important conclusions. It has shown that the equity of Minnesota's education finance system has improved in recent years. But it has also shown that inequities still exist; in particular, wealthy districts have some clear advantages over less wealthy districts.

Statistical analysis cannot, however, answer all of the important questions. It cannot tell us definitively whether the state's education finance system is equitable. Nor can it define the single best course for future policy changes. Policy makers must use their own judgment, as well as the give-and-take of the legislative process, to develop policies that will balance the desire for equity with other important goals.

APPENDIX 1

SUPPORTING DATA REGARDING RELATIONSHIP OF TAX RATES TO WEALTH

The tables in this appendix show tax rates for each wealth decile by school year. Each table covers a tax rate computed by a different method. All tax rates are in EARC mills. Tax rates shown for each decile are the weighted mean for that decile.

Table A-1 shows the gross foundation tax rate by wealth decile. The results in Table A-1 indicate that lower-wealth deciles have lower foundation tax rates, while higher-wealth deciles tend to have higher tax rates, although the differences are small. For example, groups 1 to 4, the four lower-wealth deciles, all have tax rates lower than the statewide mean for all years. Also, the lowest-wealth group has the lowest foundation tax rate in four of the five years.

However, group 10, the highest-wealth group, does not exhibit particularly high tax rates. The tax rate for this decile was third, seventh, tenth, ninth, and ninth highest for the five years studied, respectively. The relatively low tax rates for this group are explainable by the fact that this group contains off-formula districts. In the absence of full aid recapture, off-formula districts generally will have lower foundation tax rates than on-formula districts.

Table A-2 shows the weighted mean gross foundation plus referendum tax rate for each decile. The data in Table A-2

Table A-1

Relationship of Gross Foundation Tax Rate

to Property Wealth (EARC/WADM)

	Gross Foundation Tax Rate by Year (in EARC mills)									
	1981-82		1983-84		1984-85		1985-86		1986-87	
Decile (Based on Property Wealth per WADM)	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank
1 (low wealth)	21.63	10	27.30	10	28.58	8	28.52	10	29.67	10
2	22.68	8	27.82	8	28.42	9	28.93	8	30.53	6
3	22.58	9	27.64	9	29.03	7	29.24	7	30.39	8
4	23.91	7	28.46	6	29.49	6	29.68	6	30.40	7
5	24.63	6	29.68	4	30.13	5	29.99	5	30.93	4
6	25.60	2	28.85	5	30.45	4	31.26	1	30.96	3
7	25.18	4	30.98	2	31.27	1	31.03	2	31.72	1
8	26.60	1	31.02	1	30.94	2	30.86	4	31.72	1
9	24.78	5	30.87	3	30.83	3	30.88	3	30.63	5
10 (high wealth)	25.48	3	27.96	7	27.64	10	28.67	9	29.75	9
Mean	24.30		29.05		29.69		29.91		30.63	

Table A-2

Relationship of Gross Foundation Plus Referendum Tax Rate

to Property Wealth (EARC/WADM)

	Gross Foundation Plus Referendum Tax Rate by Year (in EARC mills)													
	1972-73		1978-79		1981-82		1983-84		1984-85		1985-86		1986-87	
Decile (Based on Property Wealth per WADM)	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank
1 (low wealth)	30.64	9	29.78	9	21.93	10	28.59	10	29.45	9	29.33	10	30.73	10
2	28.17	10	30.17	7	22.92	9	30.14	7	31.18	7	31.57	6	33.15	5
3	31.86	8	29.79	8	23.39	8	29.43	8	29.36	10	29.81	9	31.61	9
4	32.00	7	29.06	10	23.95	7	29.07	9	31.64	6	31.86	5	32.30	8
5	33.56	5	31.76	4	25.74	5	33.13	3	31.94	5	31.18	7	32.59	7
6	34.41	4	32.90	2	27.35	2	30.25	6	32.28	4	33.81	3	34.57	3
7	35.95	2	30.77	6	27.47	1	34.08	2	33.41	2	35.12	1	34.67	2
8	35.90	3	33.14	1	27.33	3	34.50	1	34.21	1	35.05	2	36.48	1
9	37.85	1	32.04	3	25.63	6	32.24	4	32.86	3	33.18	4	34.15	4
10 (high wealth)	32.32	6	31.14	5	26.99	4	30.44	5	29.83	8	31.03	8	33.04	6
Mean	33.14		31.06		25.28		31.20		31.65		32.19		33.26	

Source: 1972-73 and 1978-79 data are from Krupey and Hopeman, 1983.

indicate that, in general, lower-wealth districts have lower foundation plus referendum rates. In each year studied, the four lowest-wealth deciles all had mean tax rates that were lower than the statewide mean. Also, in each year the lowest-wealth decile is 9th or 10th of the deciles in mean tax rate.

Table A-3 shows the gross total school tax rate for the five years examined in this study, by decile. The gross total school tax rate includes levies for debt service, capital expenditures, transportation, community service, and maintenance.

The results in Table A-3 show that lower-wealth deciles tend to have higher gross total school tax rates, while higher-wealth deciles have lower tax rates. In all five years, group 1, the decile with lowest EARC/WADM, had the highest tax rates, and the three deciles with the lowest EARC/WADM all had tax rates greater than the mean. Conversely, in four of five years, group 10, the highest-wealth decile, had the lowest tax rate.

Tables A-4 through A-6 show the relationship of several net tax rates to school district property wealth. The net tax rates were computed only for the 1983-84, 1985-86, and 1986-87 school years.

Table A-4 shows the net foundation tax rate (i.e., excluding referendum levies) by EARC/WADM pupil group. Lower-wealth deciles tend to have lower net foundation tax rates, and higher-wealth deciles higher net foundation tax rates. For example, in each year, group 1, the lowest-wealth decile, had the lowest tax rate, and the three lowest-wealth deciles all had tax rates below

Table A-3

Relationship of Gross Total School Tax Rate

to Property Wealth (EARC/WADM)

Decile (Based on Property Wealth per WADM)	Gross Total School Tax Rate by Year (in EARC mills)									
	1981-82		1983-84		1984-85		1985-86		1986-87	
	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank
1 (low wealth)	41.18	1	47.63	1	50.51	1	51.59	1	53.73	1
2	39.99	2	43.56	3	45.61	3	48.58	2	51.25	2
3	38.04	3	43.73	2	45.71	2	46.92	4	48.99	4
4	35.29	10	41.24	7	43.47	6	46.94	3	49.52	3
5	37.76	4	43.00	4	43.99	4	43.99	8	46.02	9
6	36.99	5	40.10	9	43.66	5	45.58	6	48.12	5
7	35.57	8	42.36	5	42.86	9	46.14	5	46.97	8
8	36.20	7	42.11	6	43.42	7	44.52	7	47.66	6
9	35.57	8	40.45	8	42.90	8	43.59	9	47.47	7
10 (high wealth)	36.53	6	37.71	10	37.87	10	39.28	10	42.94	10
Mean	37.35		42.09		43.92		45.66		48.14	

Table A-4

Relationship of Net Foundation Tax Rate

to Property Wealth (EARC/WADM)

Decile (Based on Property Wealth per WADM)	Net Foundation Program Tax Rate by Year (in EARC mills)					
	1983-84		1985-86		1986-87	
	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank
1 (low wealth)	16.54	10	17.41	10	17.59	10
2	18.81	8	19.90	8	21.11	6
3	18.53	9	20.16	7	19.10	9
4	19.36	7	20.87	6	21.46	5
5	20.38	5	19.77	9	19.55	8
6	19.74	6	22.74	4	20.80	7
7	21.77	3	22.24	5	22.16	4
8	22.72	2	23.01	3	23.37	2
9	23.22	1	24.68	1	23.18	3
10 (high wealth)	21.63	4	23.41	2	24.45	1
Mean	20.32		21.44		21.31	

the mean for all three years. The three highest-wealth deciles each had a tax rate above the mean. Further, one of the two highest-wealth deciles had the highest tax rate each year.

Table A-5 shows net foundation plus referendum tax rates for each of the EARC/WADM deciles. Lower-wealth deciles tend to have lower tax rates than higher-wealth deciles. The lowest-wealth decile has the lowest tax rate in each year. Further, each year groups 1 to 4, the four lowest-wealth deciles, all have tax rates below the mean. Also in each year, groups 7 to 10, the four wealthiest deciles, have the four highest tax rates, and all four deciles have tax rates above the mean.

Table A-6 shows the net total school tax rate by EARC/WADM decile. The pattern to the results in Table A-6 is not clearly discernible. Relatively high net tax rates are found in both lower-wealth and higher-wealth deciles, as are low net tax rates.

Table A-5

Relationship of Net Foundation Plus Referendum

Tax Rate to Property Wealth (EARC/WADM)

Decile (Based on Property Wealth per WADM	Net Foundation Plus Referendum Tax Rate by Year (in EARC mills)					
	1983-84		1985-86		1986-87	
	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank
1 (low wealth)	17.37	10	17.87	10	18.18	10
2	20.38	7	21.81	7	22.96	6
3	19.79	8	20.52	9	19.87	9
4	19.76	9	22.49	6	22.83	7
5	22.86	5	20.57	8	20.65	8
6	20.75	6	24.60	5	23.27	5
7	24.09	3	25.29	3	24.27	4
8	25.39	1	26.21	2	26.92	2
9	24.15	2	26.45	1	25.70	3
10 (high wealth)	23.44	4	25.21	4	27.06	1
Mean	21.86		23.12		23.19	

Table A-6

Relationship of Net Total School Tax Rate

to Property Wealth (EARC/WADM)

Decile (Based on Property Wealth per WADM)	Net Total School Tax Rate by Year (in EARC mills)					
	1983-84		1985-86		1986-87	
	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank	Tax Rate	Tax Rate Rank
1 (low wealth)	29.13	7	31.90	9	32.20	8
2	29.55	6	33.54	2	35.43	2
3	29.56	5	32.56	7	30.99	9
4	28.08	9	33.10	6	35.09	5
5	29.63	4	29.01	10	29.19	10
6	27.58	10	33.24	4	32.53	7
7	29.90	3	33.20	5	32.90	6
8	30.93	1	33.29	3	35.27	4
9	30.37	2	34.83	1	36.18	1
10 (high wealth)	29.07	8	31.99	8	35.29	3
Mean	29.38		32.66		33.50	

APPENDIX 2

FORMULA FOR COMPUTATION OF BIVARIATE GINI COEFFICIENT

This appendix explains the computation of the bivariate Gini coefficient, used in this report as a measure of the relationship between per-pupil revenue and per-pupil wealth. The derivation of this statistic was originally published in 1921 by Conrad Gini, an Italian economist. Gini was constructing a statistical measure of inequality in the distribution of income. The development of his statistic was based on a graphic method of representing inequality, developed earlier by M.O. Lorenz, and known as the Lorenz curve.

The original Gini coefficient is a univariate measure; it is used to analyze the distribution of income, apart from any other variables. Education finance researchers have adapted the Gini coefficient to make it a bivariate measure; they use it to study the relationsnip between the distribution of per-pupil revenue and the distribution of per-pupil wealth. The particular formula used here for a bivariate Gini coefficient was developed by G. Alan Hickrod, a professor at Illinois State University. Hickrod's formula was incorporated into the computer program used in this study to calculate the bivariate Gini coefficient.[1]

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[1] For a thorough discussion of the evolution and use of the Gini Coefficient in education finance, see Raymond L. Lows, "Measurement of Inequality: The Gini Coefficient and School Finance Studies," Journal of Education Finance 10 (Summer, 1984), pp. 83-94.

Figure 1

Lorenz Curve and Bivariate Gini Coefficient

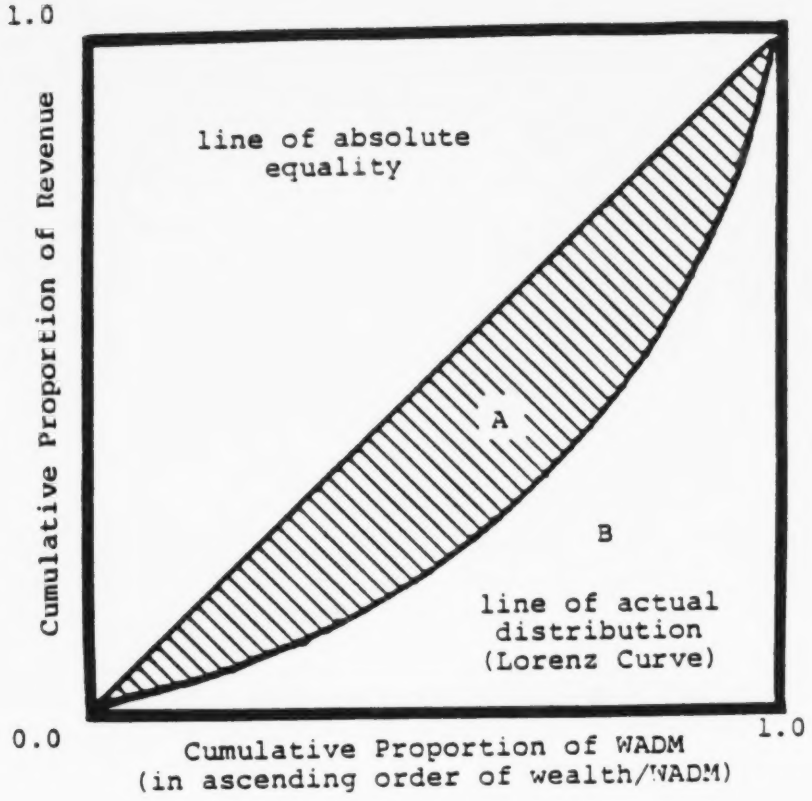

Figure 1 is an example of a Lorenz curve as used in education finance studies. The curve is constructed by first ranking all pupils in the state in ascending order according to the district property wealth per pupil. These are plotted, cumulatively, on the horizontal axis. On the vertical axis is plotted the cumulative proportion of revenue attributed to the same cumulative proportion of pupils. The Lorenz curve is the result.

If, regardless of wealth, an equal amount of revenue is apportioned to each pupil, the plotting will result in a straight line running from the lower left-hand corner of the graph to the upper right-hand corner at a 45° angle. That is, 1 percent of the revenue will be attributable to the 1 percent of pupils in the least-wealthy districts; 5 percent of the revenue to the 5 percent of pupils in the least-wealthy districts; and so on. This 45° line is the line of absolute equality.

However, if revenue per pupil is greater in wealthier districts--as is usually the case--the curve will have a concave slope. The least-wealthy 1 percent of pupils may have only 0.5 percent of revenue attributed to them; the least-wealthy 5 percent of pupils may have only 3 percent of revenue; etc. The more concave the curve, the greater is the degree of inequality.

The bivariate Gini coefficient is a measure of the degree of inequality represented by the Lorenz curve. For the curve shown in Figure 1, the Gini coefficient is computed as the ratio of Area "A" to the sum of Area "A + B".

$$\text{Gini Coefficient} = \frac{\text{Area A}}{\text{Area (A + B)}}$$

Since Area A is always smaller than Area (A + B), the Gini coefficient always has an absolute value between 0 and 1. Values closer to zero indicate greater equality; larger values indicate greater inequality. This is evident from the graph in Figure 1: the closer the line of actual distribution is to the line of absolute equality, the smaller is Area A, and the smaller is the Gini coefficient.

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